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FINAL ENVIRONMENTAL ASSESSMENT

EAST FRANKLIN-TRIUNE 161-KV TRANSMISSION LINE TAP TO CLOVERCROFT 161-KV SUBSTATION

Williamson County, Tennessee

TENNESSEE VALLEY AUTHORITY

NOVEMBER 2006

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES AND TABLES

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

°F	Degree Fahrenheit
®	Registered Trademark
APE	Area of Potential Effect
BMP	Best Management Practice
CFR	Code of Federal Regulations
DLC	Direct Load Control
e.g.	Latin term, *exempli gratia*, meaning “for example”
EMF	Electric and Magnetic Fields
EO	Executive Order
et al.	Latin term, *et alii* (masculine), *et aliae* (feminine), or *et alia* (neutral), meaning “and others”
etc.	Latin term *et cetera,* meaning “and other things” “and so forth”
GIS	Geographic Information System
HRWA	Harpeth River Watershed Association
I -	Interstate Highway
ibid	Abbreviation for the Latin term, *ibidem*, meaning “in the same place;” refers to the immediately preceding author or work cited
i.e.	Latin term, *id est,* meaning “that is”
kV	Kilovolt
MTEMC	Middle Tennessee Electric Membership Corporation
MW	Megawatt
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
OSHA	Occupational Safety and Health Administration
SHPO	State Historic Preservation Officer
SMZ	Streamside Management Zone
spp.	Species
SR	State Route
TDEC	Tennessee Department of Environmental Conservation
TVA	Tennessee Valley Authority
US	U.S. Route
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action: Improve Power Supply

Tennessee Valley Authority's (TVA) proposed action is to serve Middle Tennessee Electric Membership Corporation's (MTEMC) planned substation near Nolensville, Tennessee by building and operating an approximately 5.3-mile, 161-kilovolt (kV) transmission line connection from TVA's existing East Franklin-Triune 161-kV Transmission Line to the new substation by November 2007 (Figure 1-1). The right-of-way would occupy approximately 64 acres.

TVA would also add switches on each side of the tap point (connection point) in the East Franklin-Triune 161-kV Transmission Line and in the transmission line to be built to the planned Clovercroft 161-kV Substation. TVA would provide equipment to MTEMC that would be installed in the new substation to allow metering and system protection.

1.2. Need

MTEMC presently serves the Nolensville area from the Triune and Brentwood 161-kV Substations. This area has experienced steady, heavy growth in electric demand. Williamson County experienced a 12 percent increase in the population between 2001 and 2004, and a 2004 MTEMC study projected that the population of Nolensville would double between 2005 and 2007. Within the Nolensville city limits more than 2,000 homes, a school, and three commercial buildings are currently either under construction or are planned. These expansions are expected to add approximately 4.5 megawatts (MW) of load to the area. Additionally, several very large tracts of land are available for development in the project area that would also add to the existing and current expected load demands.

MTEMC is operating at its capacity limits in the Nolensville area. The increasing loads have been creating loading and voltage problems on the distributor's system serving this area. TVA's load studies for the area indicated that with the current and planned development, the Triune and Brentwood 161-kV Substations will be loaded approximately 25.4 MW beyond capacity by the summer of 2007.

Reliability, as well as capacity, is a concern in providing adequate service to the area. Since reliability decreases as loading increases, the peak load conditions predicted would result in a system even more likely to experience outages. To address these issues, MTEMC is planning to build a new 161-kV substation on the south side of Clovercroft Road approximately 0.9 mile southwest of Nolensville.

1.3. Objectives of the Proposed Action

To serve MTEMC's planned substation and help MTEMC meet the projected power demand in the Nolensville area, TVA proposes to construct a new 161-kV transmission line from TVA's existing East Franklin-Triune 161-kV Transmission Line to MTEMC's planned

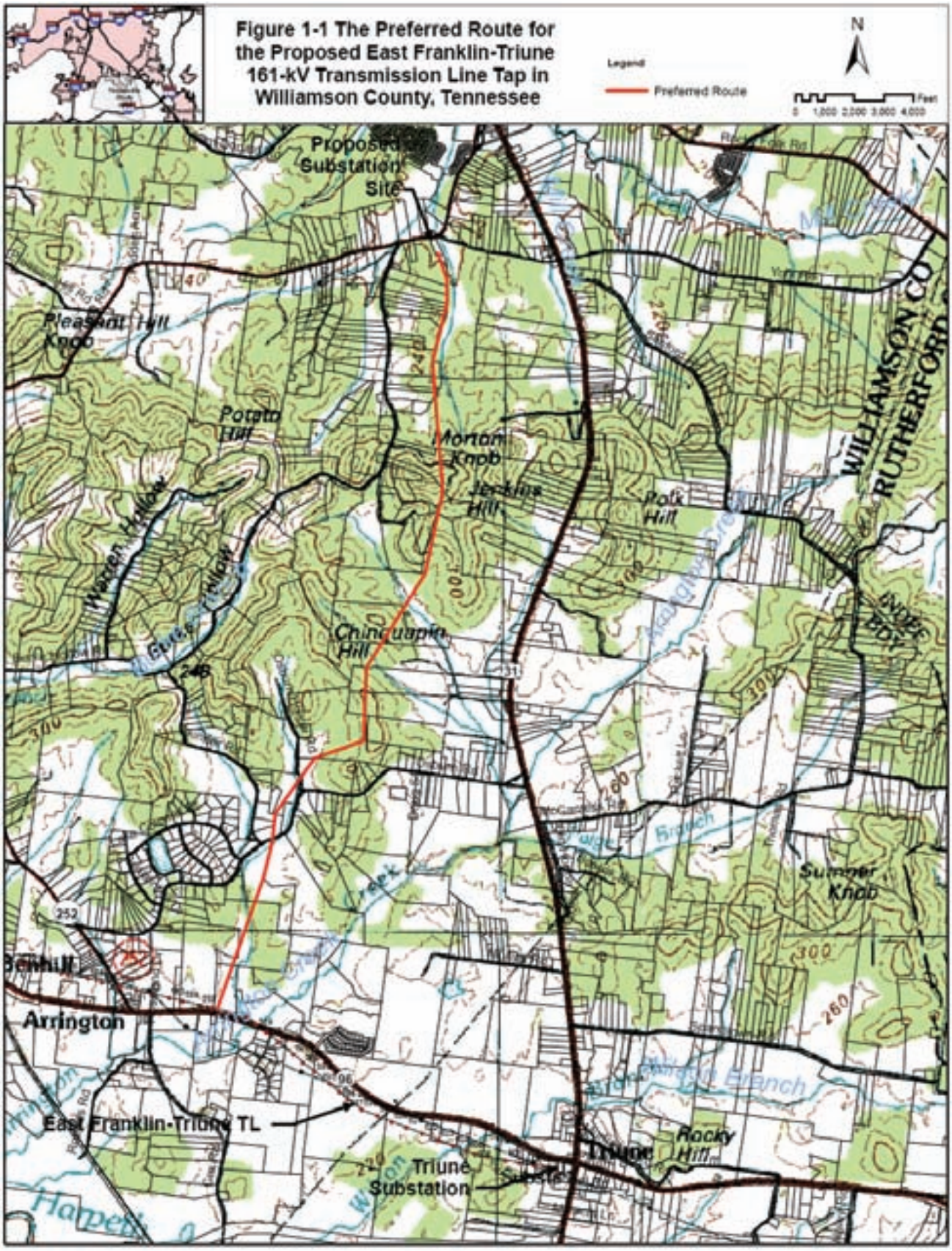


Figure 1-1 The Preferred Route for the Proposed East Franklin-Triune 161-kV Transmission Line Tap in Williamson County, Tennessee
Legend
Preferred Route
N
Feet
0 1,000 2,000 3,000 4,000
Proposed Substation Site
Pleasant Hill Knob
Potato Hill
Morton Knob
Jenkins Hill
Polk Hill
Chinquapin Hill
WILLIAMSON CO
RUTHERFORD
Summer Knob
Rocky Hill
Arrington
East Franklin-Triune TL
Triune Substation
Triune
Hampton

Clovercroft 161-kV Substation. Additionally, to minimize the outages on the Triune Substation and to facilitate and preserve the option of a future East Franklin-Triune 161-kV Transmission Line upgrade, TVA would rework a short section of the East Franklin-Triune 161-kV Transmission Line at the new tap point and at the Triune Substation. TVA would also provide 26-kV revenue metering at the planned Clovercroft 161-kV Substation for the distributor to install.

The new transmission line would supply additional electric load capacity to the MTEMC system to meet the increased load demand resulting from the planned commercial and residential growth. Additionally, the planned 161-kV substation and 161-kV transmission line connection would provide another source of power in the area for MTEMC to ensure a more reliable power supply. This would reduce the current loads at the Brentwood and Triune 161-kV Substations and avoid the anticipated overloading of the MTEMC system by ongoing and already planned development in this area.

1.4. Decisions

The primary decision before TVA is whether to serve MTEMC's planned substation by building a new 161-kV transmission line to connect to the Clovercroft 161-kV Substation. If the transmission line is built, other secondary decisions are involved. These include the following considerations:

- The timing of improvements
- The best route for a transmission line
- Determining any necessary mitigation and/or monitoring measures to implement to meet TVA standards and minimize potential damages to resources

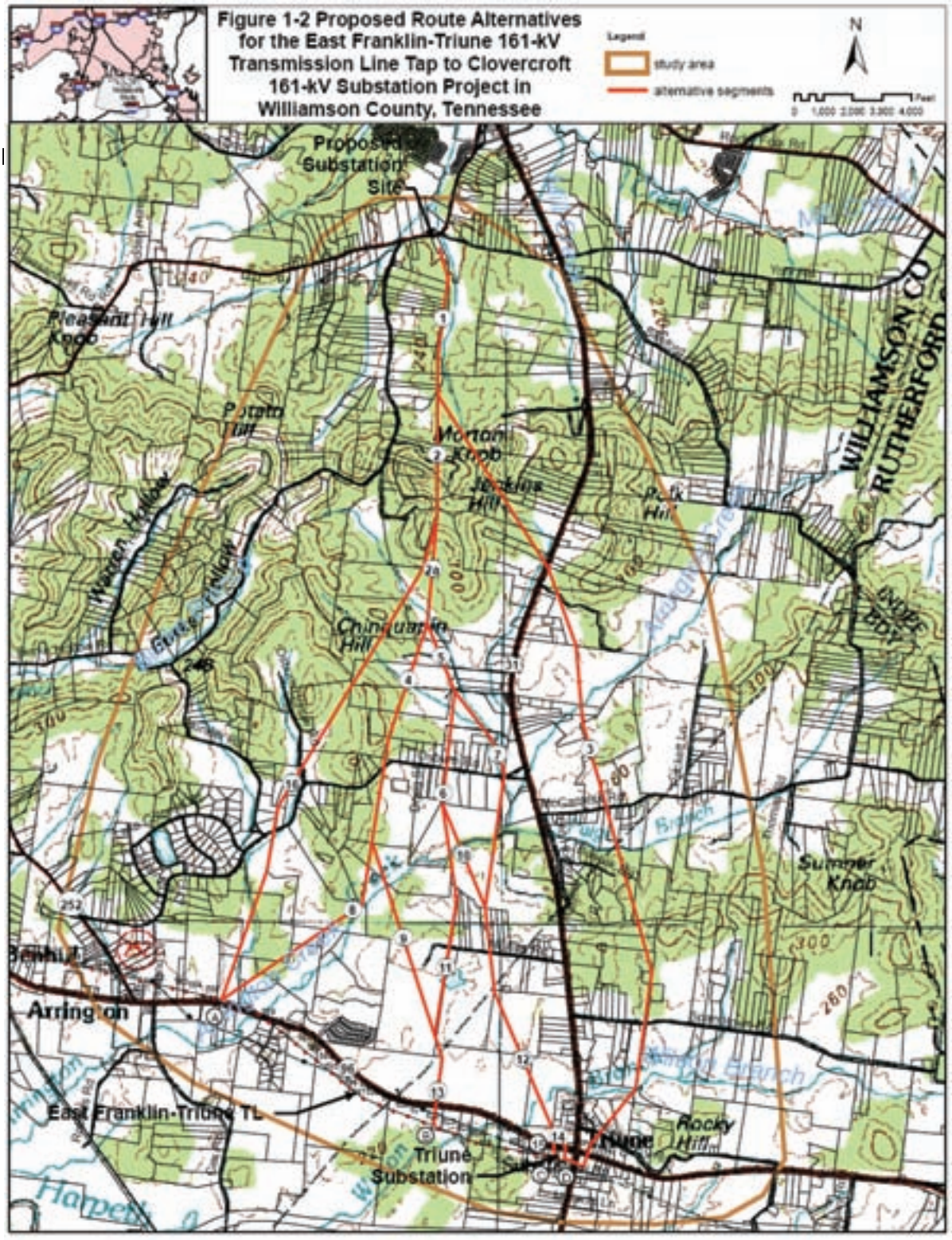
1.5. Public Involvement

The following federal, state, and local agencies have been contacted to date by TVA concerning this project:

- Harpeth River Watershed Association
- Tennessee Conservation League
- Tennessee Department of Agriculture
- Tennessee Department of Economic and Community Development
- Tennessee Department of Environment and Conservation
- Tennessee Department of Transportation
- Tennessee Historical Commission
- Tennessee Wildlife Resources Agency
- U.S. Fish and Wildlife Service

This proposal was reviewed in accordance with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), Farmland Protection Policy Act, National Historic Preservation Act, Endangered Species Act, Section 404 of the Clean Water Act, and EO 12372 (Intergovernmental Review). Correspondence received related to this coordination is contained in Appendix I.

TVA held a public meeting in the project area on April 28, 2005. Nine potential transmission line route options were presented to the public. These routes are described in Section 2.5.3 of this document as Routes 1 through 9 (Figure 1-2).



Public officials and 380 potentially affected property owners within these corridor routes were specifically invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. Total attendance at the meeting was 200.

During a 30-day public comment period following the open house, TVA accepted public comments on potential transmission line routes and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. Comments were primarily related to the location of the transmission line relative to current or planned land uses. Many commenters provided information and land-use updates that enhanced TVA's understanding of route issues and usage constraints. The commenters did not express a clear preference for any route option.

1.6. Necessary Permits or Licenses

A permit would be required from the State of Tennessee for construction site storm water discharge for the transmission line construction. TVA's Transmission Line Construction organization would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit would also be required for burning trees and other combustible materials removed during transmission line construction.

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CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Introduction

A description of the various alternatives considered is provided in this chapter. Additional background information about transmission line construction, operation, and maintenance is also provided. This chapter has the following five major sections:

- Description of Alternatives
- Alternative Eliminated From Detailed Study
- Description of Construction, Operation, and Maintenance of the Existing and Proposed 161-kV Transmission Line
- Project and Siting Alternatives
- Identification of the Preferred Alternative

This chapter describes all of the alternatives explored and provides a detailed description of the necessary steps in constructing a transmission line.

2.2. Description of Alternatives

2.2.1. Alternative 1 – Do Not Construct the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (No Action)

Under the No Action Alternative, TVA would not construct 5.3 miles of new 161-kV transmission line to serve the new Clovercroft 161-kV Substation. As a result, the MTEMC could decide to build the transmission line itself. If it did so, the potential impacts resulting from the implementation of the No Action Alternative would be similar to those of the Action Alternative that are described in Chapter 4, and perhaps more severe depending on the route chosen and the construction methods used by MTEMC.

Absent this, portions of the transmission system in the Nolensville area of Williamson County would continue to operate with a high risk level of interruption in certain situations, especially at times of high electricity use. This risk is projected to increase over time as the electrical loads in the area grow due to ongoing and already planned development. Without a new 161-kV substation and new 161-kV transmission lines, as early as 2007, these increasing power loads would not be sustained by MTEMC's Triune and Brentwood 161-kV Substations.

Alternatively to building its new substation, MTEMC could have decided to upgrade its Brentwood 161-kV Substation by installing a third transformer. To serve the expanding load, this plan would require rebuilding approximately 31 miles of existing distribution lines from the Almaville, Brentwood, Triune, and Interchange City Substations to the Nolensville area and would include the associated impacts of this construction. The potential impacts associated with rebuilding the distribution line could be less than building a new substation and TVA's proposed 5.3 interconnection transmission line because the impacts from rebuilding the distribution line would occur on existing rights-of-way.

However, because of the long length of the distribution lines that would have to be rebuilt, the risk of outages related to line exposure would be higher. Additionally, due to continued load growth that is anticipated this would not have solved the voltage problems to the area. Additional voltage support in the form of voltage regulators would be required within a few years. With these considerations, it was determined that this alternative would not address the reliability or capacity problems in the MTEMC service area.

2.2.2. Alternative 2 – Construct and Operate the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (Action)

Under the Action Alternative, TVA would construct and operate a new 5.3-mile 161-kV transmission line connecting the East Franklin-Triune 161-kV Transmission Line with MTEMC's planned Clovercroft 161-kV Substation in Williamson County, Tennessee. Other sources in the area, such as the East Franklin-Brentwood-Radnor lines, were considered and rejected due to 1) the large amounts of existing development around these other sources; 2) the reduced reliability of these sources due to the current number of supported delivery points; and 3) limitations of future system improvements to connect the East Franklin-Triune Transmission Line to the Murfreesboro Substation.

The transmission line would be built on new right-of-way 100 feet wide. TVA would also provide metering and protection equipment at the Clovercroft 161-kV Substation for the distributor to install. TVA would poll the meter via telephone.

To install the tap point and switches at the planned Clovercroft 161-kV Substation, the existing East Franklin-Triune radial (single source) 161-kV Transmission Line would be taken out of service, thereby turning off power to the Triune Substation. During this outage, TVA would revise the connection at the Triune Substation to minimize future outages and facilitate and preserve the option of constructing a future transmission line from Murfreesboro.

At the proposed East Franklin-Triune 161-kV Transmission Line tap point leading to the Clovercroft 161-kV Substation, a section of the East Franklin-Triune 161-kV Transmission Line approximately 100 to 200 feet on either side of the tap would be retired, including Structures 585 to 587, and replaced with larger conductor. Two switches would then be installed in the existing East Franklin-Triune 161-kV Transmission Line, one on either side of the tap structure. An additional switch would be installed in the new tap line approximately 50 feet north of the tap.

At the Triune Substation, TVA would revise the configuration into the substation to allow for the tap into Triune and to facilitate the construction of the future East Franklin-Murfreesboro 161-kV Transmission Line. TVA would retire one three-pole structure inside the substation, install one switch structure inside the western substation fence, and install one switch, a two-pole dead end, and a single-pole structure outside of the eastern fence of the substation. Additionally, TVA would install approximately 400 feet of larger conductor over the substation from existing Structure 612 (located just outside the western substation fence) to the single-pole structure that would be located west of US 31A. All of this work would take place on existing substation property or within the existing right-of-way for the future East Franklin-Murfreesboro 161-kV Transmission Line. This alternative would serve the planned MTEMC substation and help meet the growing power needs in the Nolensville area.

2.3. Alternative Eliminated From Detailed Study - Load Reduction and/or Conservation

MTEMC and TVA estimate that the MTEMC service area system needs will be approximately 30 MW above firm capability by June 2007. TVA currently operates energy conservation programs that TVA and distributors cooperatively promote and expand. Energy-efficiency initiatives throughout the MTEMC service area have resulted in a 43.8-MW reduction from October 2000 through October 2005. These initiatives include *energy right*® installations and the Direct Load Control (DLC) program (Appendix II).

Due to the rapid growth in electricity demand and planned increases of new homes in the Nolensville area, current conservation efforts will not be sufficient to offset the projected 2007 deficit. At the current rate of implementation, existing programs will provide an incremental reduction of approximately 8.6 MW for the entire 2,000 square mile MTEMC service area, of which the Nolensville/Clovercroft area represents 3 percent.

It is extremely unlikely that development and implementation of any additional conservation efforts would be possible in a time frame that would meet the identified system needs. This assumption is based on the findings of a 2002 study of demand-side management options for the Tennessee Valley. This study explored energy-efficiency program options that could supply electricity savings within two years. This study indicated a potential load reduction of 3.7 average MW and 7.6 peak MW over a two-year period across the entire MTEMC area using current customer base ratios (Appendix II).

The combination of existing and proposed efficiency programs could result in additional peak load reduction of 12.4 MW in the MTEMC service area through June 2007. Prorating these conservation efforts to the Nolensville/Clovercroft area using square miles of area served as the basis, the resulting load reduction would have been less than 1 MW. This reduction would leave a Nolensville/Clovercroft area system deficit of 29 MW. Based on this 29 MW deficit, conservation was ruled out as the means to meet the system needs during this time frame.

2.4. Description of Construction, Operation, and Maintenance of the Existing and Proposed 161-kV Transmission Line

2.4.1. Transmission Line Construction

2.4.1.1. Right-of-Way Acquisition and Clearing

Approximately 5.3 miles of new right-of-way 100 feet wide would be needed for the proposed transmission line that would connect TVA's existing East Franklin-Triune 161-kV Transmission Line and the planned Clovercroft 161-kV Substation.

TVA would purchase easements from landowners for the new right-of-way on private land. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees off the right-of-way. Danger trees are those trees that are located away from the cleared right-of-way, but are tall enough to pass within 5 feet of a conductor or strike a structure should it fall toward the transmission line. Fee title, i.e., ownership, for the land within the right-of-way remains with the landowner, and a number of activities may be continued on the property by the landowner. However, the easement agreement prohibits certain activities such as the construction of buildings

and any other activities within the right-of-way that could interfere with the transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would be initially removed from the entire width of the right-of-way. Equipment used during this right-of-way clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the right-of-way to serve as sediment barriers.

Streamside management zones (SMZs) would be established along intermittent and perennial streams; their width would be based on stream characteristics, slope, soil types, and other factors (Muncy 1999). Vegetation removal in SMZs and wetlands would be restricted to trees tall enough, or with the potential soon to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. *TVA Right-of-Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, and Transmission Construction Guidelines Near Streams* (Appendices III, IV, and V) would be followed in clearing and construction activities.

Subsequent to clearing and construction, the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grass and other low-growing species. Erosion controls such as silt fences would remain in place until adequate plant cover is established. Streamside areas would be revegetated as described in Appendices III through V.

2.4.1.2. Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the new right-of-way. Nine access roads totaling approximately 3 miles in length were identified along the proposed transmission line. These access roads are primarily existing roads that include privately built, farm and field roads, some of which may need upgrading. Typically, the access roads are located on the right-of-way wherever possible and designed to avoid areas with steep slopes and to minimize stream crossings. The roads are typically about 20 feet wide and surfaced with dirt or gravel. Along the new transmission line, TVA would obtain the necessary rights for these access roads from landowners.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (i.e., streams that run only following a rainfall), they would be left or removed, depending on the wishes of the landowner or on any permit conditions that might apply. If desired by the property owner, new temporary access roads would be restored to previous conditions. Additional applicable right-of-way clearing and environmental quality protection specifications are listed in Appendices III and IV.

2.4.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. The site identified for this project is located just off of State Route (SR) 96 and Interstate Highway (I-) 24 behind Corky's Barbeque in Murfreesboro (Figure 2-1). The construction assembly area for this project is approximately 3 acres in size and is currently leased by TVA. This location, an abandoned parking lot that is already graveled and fenced, has also been used for several other construction projects in the area and would require no additional grading. Consequently, no other possible sites for a laydown area are likely to result in lesser impacts. Trailers used during the construction process for material storage and office space may be parked at this location. Additional siltation controls would be installed if necessary to protect any on-site drainageways. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site.

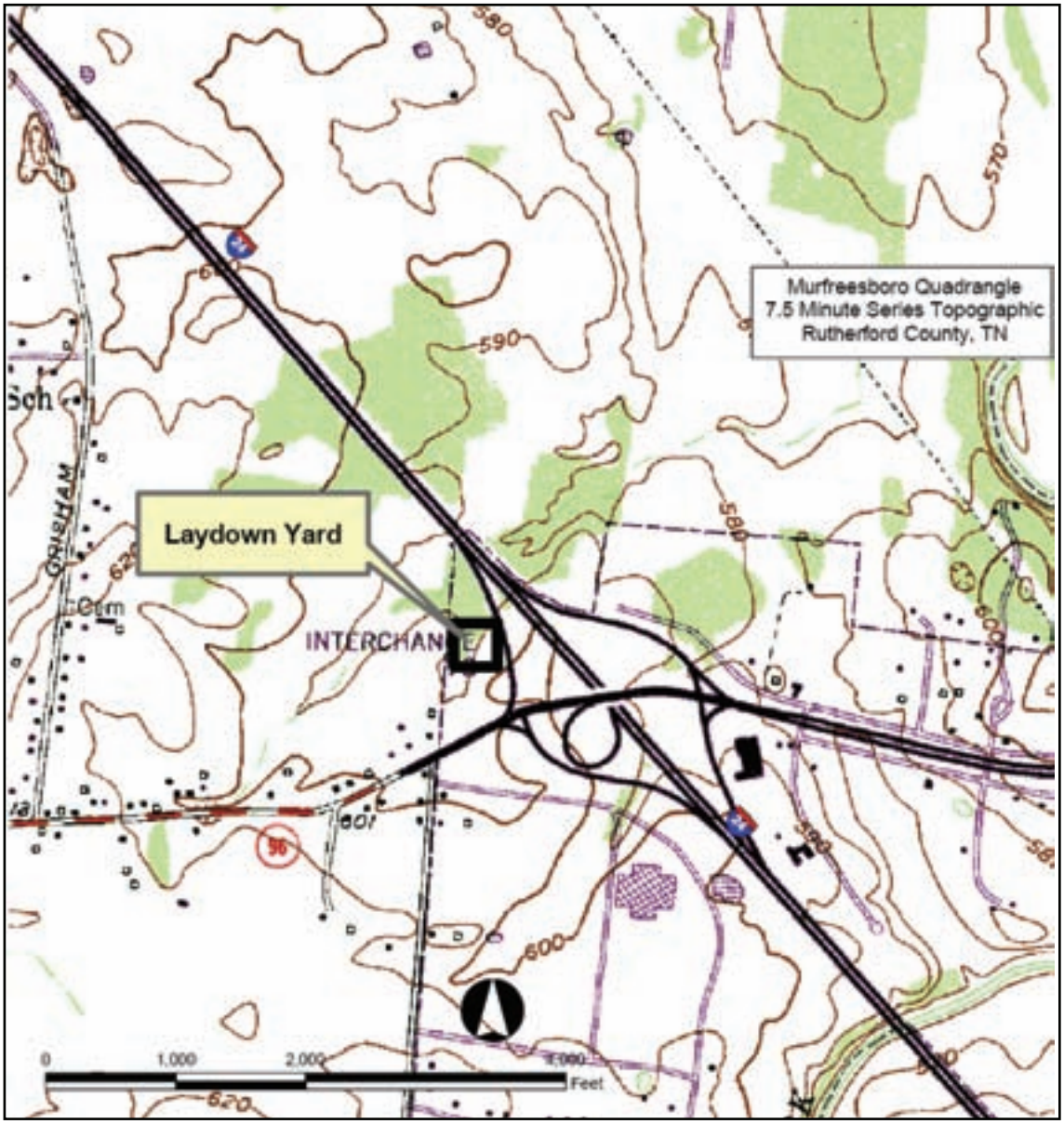

Figure 2-1. Construction Laydown Area for the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation

2.4.1.4. Structures and Conductors

The proposed 161-kV transmission line tap from the interconnection point at the East Franklin-Triune 161-kV Transmission Line to the new substation would be built using single-steel-pole structures (Figure 2-2). Structure type and heights would vary according to the terrain and would range between 90 and 100 feet. Additionally, a three-pole dead end structure with three switch structures (one on either side and one in front) would be installed at the tap point (Figure 2-3).

Figure 2-2. Single-Pole 161-kV Transmission Structure

Figure 2-3. Three-Pole Dead End Transmission Structure With Switch Structures

Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating current transmission lines. For 161-kV transmission lines, each conductor is made up of a single cable. The conductors are attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground wire(s) is attached to the top of the structures. This ground wire may contain fiber optic communication cables.

Poles at angles in the transmission line may require supporting guy wires. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. The holes would normally be backfilled with the excavated material. In some cases, gravel or a cement and gravel mixture might be necessary. Some structures may be self-supporting (non-guyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (e.g., areas with soft ground) to reduce the potential for environmental impacts.

2.4.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the right-of-way. Temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. Installation of conductors would begin with a small rope being pulled from structure to structure. This rope would then be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators mounted on the structures. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Finally, the wires would be clamped to the insulators and the pulleys removed.

2.4.2. Operation and Maintenance

2.4.2.1. Inspection

Periodic inspections of TVA's transmission lines are performed from the ground and by aerial surveillance using a helicopter. These inspections, which occur on approximately two- to three-year cycles after operation begins, are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions that might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the right-of-way, as well as immediately adjoining the right-of-way, is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

2.4.2.2. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. The transmission line would be designed to meet a 24-foot minimum clearance for a 161-kV transmission line.

Management of vegetation along the right-of-way would consist of two different activities: namely, the felling of danger trees adjacent to the cleared right-of-way, as described in Section 2.4.1.1, and the control of vegetation within the cleared right-of-way.

Management of vegetation within the cleared right-of-way would use an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. A vegetation-reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. Given the land use in the area of this project, right-of-way maintenance is expected to be minimal. The two principal management techniques are mechanical mowing, using tractor-mounted rotary mowers, and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the right-of-way and mechanical mowing is not practical. Herbicides would be selectively applied by helicopter or from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used would be applied in accordance with applicable state and federal laws and regulations and the commitments listed in this document. Only herbicides registered with the U.S. Environmental Protection Agency (USEPA) would be used. A list of the herbicides currently used by TVA in right-of-way management is presented in Appendix VI. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

Other than vegetation management, little other maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, the structure would normally be lifted out of the ground by crane-like equipment and the replacement structure would be inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible. Replacement of structures may require leveling the area surrounding the replaced structures, but there would be little, if any, additional area disturbance when compared to the initial installation of the structure.

2.5. Project and Siting Alternatives

TVA's transmission line siting evaluation is used to identify reasonable transmission line route alternatives and a preferred route. The preferred route can then be further adjusted in response to comments TVA receives from landowners, other stakeholders, and officials during the public review. TVA's transmission line siting process is comprehensive and takes into account a large number of criteria, including potential environmental impacts, to narrow down the typically large number of possible transmission line routes.

When TVA proposes to serve some location (a new substation as is the case here), it begins by identifying a study area and within that study area, transmission line route options or corridors. These corridors can be broad (miles wide). After assessing the feasibility of the identified corridors, the siting process typically rates one or two corridors as preferable options for routing the proposed transmission line, and further analysis of these corridors continues. TVA then identifies one or more feasible transmission line routes within the remaining corridors and presents these to the public.

As such, the process of siting the proposed transmission line adhered to the following basic steps used by TVA:

- Determine potential existing power sources to supply the substation.
- Define the study area.
- Collect data to minimize potential impacts to cultural and natural features.
- Develop general route options and potential routes.
- Gather public input.
- Incorporate public input into the final identification of the transmission line route.

2.5.1. Definition of Study Area

The first task in defining the study area was to identify a power source that could supply the identified objective. The most practical power source was identified as the East Franklin-Triune 161-kV Transmission Line, which is located approximately 4 miles south of the planned Clovercroft 161-kV Substation. Based on this location, the study area was defined as an area that encompasses approximately 22 square miles or 14,000 acres and is located entirely within Williamson County (Figure 1-2). The boundaries to the north and south are defined by the proposed location of the substation and the existing East Franklin-Triune 161-kV Transmission Line, respectively. The boundary to the west is defined primarily by development along SR 96 and along SR 252. The boundary to the east is defined by development along SR 96 and County Road 518. Any study areas to the west or east of the defined area would not be economically beneficial because of the additional costs associated with impacts to development and increased transmission line lengths. Because the study area for this project is relatively narrow, instead of defining corridors, the study area was reviewed for possible alternative transmission line routes.

A geographic information system (GIS) based routing map and color orthophotography were developed. The GIS data generated a “constraint” model that served to guide the siting process by identifying obvious routing conflicts or sensitive areas including, but not limited to, houses, rivers, historical sites, and wetlands. Following is a brief description of other aspects of the study area.

- Natural and Cultural Features: The study area is characterized by generally level to rolling terrain, although the western portion is steeper. There are several water sources, including Wilson Branch, the headwaters of Mill Creek, and various branches of Arrington Creek. Minimizing stream crossings was a primary consideration for transmission line routing. I-840 runs east and west less than 1 mile south of the East Franklin-Triune 161-kV Transmission Line. US 31A (Nolensville Road) runs north and south through the study area.

- Land Use: The study area currently consists primarily of a combination of forested areas, agricultural fields, pasturelands, and residential areas. The largest population center is Nolensville; Franklin is on the western edge of the study area.

- Transportation: Major transportation routes in or near the study area include I-840, SR 96, and US 31A. Other roads include Clovercroft Road, Burke Hollow Road, and Osburn Road.

2.5.2. Collect Data

Geographic data, such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information were collected for the entire study area. Analysis of the data was aided by using GIS. This

system allowed the multitude of factors of the study area to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

Maps were created to show regional opportunities and constraints clearly. Sources included 1 inch = 500 feet aerial photography, county tax maps/property boundaries, U.S. Geological Survey digital line graphs, digital elevation models, National Wetlands Inventory (NWI), and cultural resource data, among others. Aerial photography was interpreted to obtain land-use and land-cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries. Data were analyzed both manually and with GIS. Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels.

2.5.3. Develop General Route Options and Potential Transmission Line Routes

The proposed transmission line would include the installation of switches at a tap point in an existing transmission line. Because switches are manually operated, they must be located in areas of the transmission line that have easy access such as near roadways. Therefore, during the siting process, it was important to identify potential tap points before selecting possible alternative transmission line routes.

Topographical maps, aerial photography, and the Williamson County tax maps were examined to identify potential tap points to the East Franklin-Triune 161-kV Transmission Line. In addition, a site visit was made to the potential tap points to identify any possible problem areas. The East Franklin-Triune 161-kV Transmission Line roughly follows SR 96 from the Triune Substation to the East Franklin Switching Station. Leaving the Triune Substation, the transmission line is on the south side of SR 96 and then crosses over to the north side of the road. The site visit identified residential development on the south side of SR 96 in the area of Structures 589 to 592 and north of SR 96 across from Structures 592 to 599. Both sides of the road where the existing transmission line crosses were not identified as possible sites because of the residential development on the south side and Arrington Creek on the north side. Any possible tap location would require a short access from SR 96. From the information gathered during the system studies, data development phases, and site visit, four possible tap points were identified in the East Franklin-Triune 161-kV Transmission Line:

- Tap Point A, between Structures 586 and 587
- Tap Point B, between Structures 602 and 603
- Tap Point C, on the west side of the Triune Substation
- Tap Point D, on the east side of the Triune Substation

Using these identified tap points and the planned Clovercroft 161-kV Substation site, the topographical map, GIS map, aerial photography, and Williamson County tax maps were then examined to define alternative transmission line routes. The tax maps provided property boundaries, which were used to locate that would minimize impacts as to the number of properties as well as to individual properties. Additionally, a site visit was made to observe any potential problems in the study area that had not yet been identified. In addition to the developments described above, the site visit also identified a house under construction on Osburn Road. During the siting process, TVA identified nine potential alternative routes (Table 2-1 and Figure 1-2).

Table 2-1. Alternative Routes for Proposed Transmission Line

Route Number	Tap Point	Segment Sections
1	A	16, 2, and 1
2	A	8, 4, 2a, 2, and 1
3	B	13, 9, 4, 2a, 2, and 1
4	B	13, 11, 6, 5, 2a, 2, and 1
5	C	15, 12, 10, 6, 5, 2a, 2, and 1
6	C	15, 12, 7, 5, 2a, 2, and 1
7	D	14, 12, 10, 6, 5, 2a, 2, and 1
8	D	14, 12, 7, 5, 2a, 2, and 1
9	D	3 and 1

Route 1 would begin at Tap Point A, approximately 190 feet east of Structure 586 and about 100 feet north of SR 96. From the tap point, the route would utilize Segment 16 and head slightly northeast approximately 4,680 feet, crossing a tributary to Arrington Creek. The route would then turn and continue north approximately 2,270 feet, crossing Osburn Road and another tributary to Arrington Creek. Route 1 would proceed northeast approximately 9,800 feet, crossing Osburn Hollow Road and several tributaries to Arrington Branch to a point about 115 feet east of a property corner. The route would then utilize Segment 2 and head northeast approximately 1,400 feet to a property corner, and then continue northwest approximately 5,860 feet to a property line. Next, Route 1 would proceed northeast along Segment 1 for approximately 2,860 feet to another property line. Finally, the route would turn northwest approximately 1,000 feet to the substation property. A tributary to Mill Creek parallels Route 1 for approximately 3,000 feet into the substation. At the request of the Harpeth River Watershed Association (HRWA), the centerline of this section would be at least 150 feet from the creek. Route 1 would be approximately 5.3 miles in length.

Route 2 would also begin at Tap Point A; however, from the tap point, the route would utilize Segment 8 and head northeast for approximately 5,800 feet to a property line located about 100 feet from Arrington Creek. The route would then turn north for another 5,800 feet, crossing Osburn Road to a property corner. It would then follow Segment 4 and turn slightly northeast for about 4,100 feet, crossing one tributary to Arrington Creek to a property line about 250 feet south of Arrington Creek and 850 feet southeast of Ozburn Cemetery. The route would continue north along Segment 2a for about 3,600 feet to a property corner. Finally, Route 2 would follow the same path as Route 1 (Segments 2 and 1) into the proposed substation. Route 2 would be approximately 5.4 miles in length.

Route 3 would begin at Tap Point B, approximately 240 feet west of Structure 603 and about 650 feet south of SR 96. From the tap point, the route would utilize Segment 13 and head due north along a property line approximately 2,300 feet. After reaching a property corner, Route 3 would turn northwest along Segment 9 for approximately 7,800 feet before reaching a point that follows the same path to the substation as Route 2 (Segments 4, 2a, 2, and 1). Route 3 would be approximately 5.8 miles long.

Route 4 would also begin at Tap Point B. From the tap point, the route would follow Segment 13 before turning northeast onto Segment 11 and following along a property line for roughly 4,800 feet, crossing Mullins Road. Approximately 500 feet from the northern edge of this property, Route 4 would turn slightly northwest, traveling about 3,400 feet,

across Arrington Creek to another property corner. Route 4 would then turn back slightly northeast utilizing Segment 6 for approximately 3,800 feet, crossing Osburn Road and a tributary to Arrington Creek to a property corner. Next, the route would proceed northwest using Segment 5 for about 2,500 feet, staying approximately 300 feet on the southwest side of a tributary to Arrington Creek. From this point, approximately 250 feet south of Arrington Creek, Route 4 would follow the path of Routes 2 and 3 into the substation (Segments 2a, 2, 1). Route 4 would be approximately 5.8 miles long.

Route 5 would begin at Tap Point C, located on the west side of the Triune Substation approximately 300 feet south of SR 96. From the tap point, the route would utilize Segment 15 and head north approximately 1,100 feet, across SR 96 to a point on the northern property line about 900 feet west of US 31A. The route would then turn northwest along Segment 12 for approximately 5,000 feet, crossing Wilson Branch. Route 5 would turn slightly north and proceed for about 3,000 feet, crossing Mullins Road. Using Segment 10, Route 5 would then turn northwest for approximately 3,800 feet, crossing Paige Branch. From this point approximately 1,200 feet south of Osburn Road, Route 5 would follow the path of Route 4 (Segments 6, 5, 2a, 2, and 1) into the substation. Route 5 would be approximately 6.1 miles in length.

Route 6 would also begin at Tap Point C following the same path as Route 5 (Segments 15 and 12) for the first 9,100 feet. Then, at a point approximately 1,600 feet north of Mullins Road, the route would turn northeast across Paige Branch (Segment 7), traveling approximately 4,700 feet to a point about 60 feet north of Osburn Road and 160 feet east of a creek. Route 6 would then turn in a northwesterly direction, meandering between two tributaries to Arrington Creek for about 3,300 feet. From this point, approximately 2,600 feet north of Osburn Road, the route would continue along the same path as Routes 4 and 5 (Segments 5, 2a, 2, and 1) into the substation. Route 6 would be approximately 6.1 miles long.

Route 7 would begin at Tap Point D, located on the east side of the Triune Substation approximately 250 feet south of SR 96. From the tap point, the route would head north approximately 400 feet utilizing Segment 14 to a point on a property boundary approximately 50 feet north of SR 96. The route would then turn northwest for about 850 feet to the northern edge of a property line about 900 feet west of US 31A, as described above for Route 5. The rest of the route would follow the same path as Route 5 (Segments 12, 10, 6, 5, 2a, 2, and 1) into the substation. Route 7 would be approximately 6.1 miles in length.

Route 8 would also begin at Tap Point D following the same path as Route 7 for the first 1,250 feet (Segments 14 and 12), then would follow the path of Route 6 (Segments 7, 5, 2a, 2, and 1) all the way to the substation. Route 8 would be approximately 6.2 miles long.

Route 9 would begin at Tap Point D; however, this route would proceed slightly southeast out of the Triune Substation for about 750 feet (Segment 3), crossing US 31A. The route would then turn northeast for about 850 feet, crossing SR 96 to a property corner. Next, it would turn further northeast and continue approximately 2,500 feet to another property corner, crossing Old Murfreesboro Road and Wilson Branch. Approximately 50 feet north of Wilson Branch, the route would continue north for about 4,000 feet, crossing Spanntown Road. Route 9 would proceed northwest for approximately 8,900 feet, crossing Paige Branch and McCanless Road before reaching another property corner. Route 9 would continue north for approximately 2,600 feet across Arrington Creek to a property boundary,

then turn slightly northwest and proceed for approximately 2,800 feet across Big Oak Road to a point about 75 feet southeast of US 31A. The route would then turn northwest across US 31A and tributaries to Arrington and Mill Creek for approximately 7,000 feet. The remaining 5,000 feet or so is shared by all of the alternative routes (Segment 1). Route 9 would be approximately 6.5 miles in length.

2.5.4. Establish and Apply Siting Criteria

TVA has long employed a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. The criteria are oriented toward factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations, property, and right-of-way acquisition cost being the most important elements. Information gathered and comments made at the public meeting and subsequent comment period were taken into account, while refining criteria to be specific to the study area.

Each of the transmission line route options was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below. For each category described, a higher score means a bigger constraint. For example, a greater number of streams crossed or impacted, a longer transmission line route length, or a greater number of historic resources affected would give an alternative transmission line route a worse score.

- *Engineering Criteria*: Total length of the transmission route, length of new right-of-way and rebuilt right-of-way, primary and secondary road crossings, pipeline and transmission line crossings, and total line cost

- *Environmental Criteria*: Slopes greater than 30 percent (steeper slopes have more potential for erosion and water quality impacts), slopes between 20 and 30 percent, visual aesthetics, forests, open water, sensitive streams (those supporting endangered or threatened species), perennial and intermittent streams, wetlands, rare species habitat, natural areas, and wildlife management areas

- *Land-Use Criteria*: The number of fragmented property parcels, schools, houses, commercial or industrial buildings, barns, and parkland crossings

- *Cultural Criteria*: Archaeological and historic sites, churches, and cemeteries

Scores for each of the alternatives were calculated by adding individual criterion values for each potential transmission line route. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking for each route in each subcategory (engineering, environmental, land use, and cultural).

A weighted score was produced for each transmission line route in each subcategory. This made it possible to understand which routes would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.5.5. Route Evaluation and Identification

Following the public open house and subsequent comment period, each tap point and route alternative was evaluated using the updated constraint model along with the modified routing criteria obtained during the public involvement.

Land use was the most important concern of the private landowners who attended the public meeting or submitted comments. Additionally, members of the public provided several important concerns to TVA for consideration during the evaluation and selection of the proposed project transmission line route. One issue identified was a large piece of property within Segment 2 that is currently being subdivided for residential development. This segment section is common to all of the alternative routes except Route 9.

TVA was also informed of a site associated with the Civil War east of US 31A. Given this information along with the high potential for other cultural resources in the study area, TVA performed an architectural and archaeological reconnaissance of all the alternative routes in June 2005. This investigation confirmed the presence of the Triune Fortification Complex, a site that is listed on the National Register of Historic Places (NRHP), within the corridor of Route 9. The survey also noted that Routes 1 and 2 exhibited the lowest potential for archaeological resources due to steeper terrain and fewer stream crossings than the other seven alternative routes. In addition, within the Routes 6 through 9 corridors, the architectural survey identified eight previously recorded properties and three previously unrecorded properties that are potentially eligible for the NRHP.

Another concern identified was the presence of a conservation easement on property in the study area. The owners of a 112-acre farm on Osburn Road have donated a conservation easement on their property to the Land Trust for Tennessee to preserve its environmental integrity, including visual aesthetics, prime farmland, and water quality. The Land Trust for Tennessee is a nonprofit organization that was founded in 1999 in conjunction with the Heritage Foundation of Franklin and Williamson County. Its mission is to “preserve the unique character of Tennessee’s natural and historic landscapes for future generations,” primarily in Middle Tennessee (Land Trust for Tennessee 2001). This property is located within the corridor of Segment 4, and thus would impact Routes 2 and 3.

HRWA also provided comments (Appendix I) regarding the proposed routes as well as on an energy-efficiency pilot project in the Franklin area. HRWA has been working with TVA and MTEMC since 2001 regarding another 161-kV transmission line project that traverses the Franklin area of Williamson County. Consequently, since the proposed project would cross tributaries of the Harpeth River, they had an interest in this project as well. HRWA’s primary concern was to ensure that the number of stream crossings was minimized and that riparian zones were left undisturbed to the extent possible. They also expressed concerns about the conservation easement discussed in the previous paragraph. Their energy-efficiency concerns are addressed in Section 2.3 and Appendix II.

Each of these additional identified factors was taken into consideration, and the proposed alternative route segments were modified where possible to avoid future conflicts related to these issues. The proposed section of transmission line that would have crossed the planned subdivision and affected eight of the proposed route alternatives was relocated to the east to avoid this future development.

In addition to the presence of the Triune Fortification Complex and an increased potential for architectural and archaeological resources, Route 9 as proposed would cross more

streams than most of the proposed alternatives and was therefore the route least preferred by HRWA. Route 9 would also be anywhere from 0.4 to 1.2 miles longer than the other options and had more opposition from property owners because more houses (12) are within 300 feet of the proposed transmission line. For these reasons, Route 9 was not selected as the preferred route option.

Routes 5 through 8 follow the same general corridor from Tap Points C and D. These routes occur within the eastern half of the study area and are characterized by level terrain and more water sources relative to the western portion of the study area. As such, each of these four route alternatives cross more streams (Routes 6 and 8 each have nine crossings). Similar to Route 9, these routes have a greater potential to affect cultural resources due to their proximity to streams and steeper terrain. Furthermore, each of these routes has homes that occur within 300 feet of the proposed transmission lines, and a barn is located within the right-of-way of two of the alternatives (Routes 5 and 7). All of these route alternatives would be approximately 6 miles, roughly 0.8 mile longer than the shortest alternative. For these reasons, Routes 5, 6, 7, and 8 were not selected as the preferred route alternative.

Routes 3 and 4 each begin at Tap Point B. Route 4 would cross a small wetland, pass within 300 feet of four houses, and would be approximately 0.5 mile longer than the shortest alternative and would cross through the conservation easement area. Additionally, according to the cultural reconnaissance, Route 4 would have a greater potential to affect cultural resources than the three westernmost alternatives. For these reasons, Routes 3 and 4 were not selected as the preferred route alternative.

Based on the analysis of the routing criteria from both before and after the public meeting, Routes 1 and 2 were rated as the most desirable routes. This is partially because these routes as proposed would cross hilly terrain and the fewest number of streams, and they exhibit the least potential to affect cultural resources. Furthermore, Tap Point A was the most desirable location because it is located north of SR 96 and would not require road crossings for either Route 1 or 2. While both of these routes would minimize environmental impacts, Route 2 would cross the conservation easement area and, therefore, Route 2 was not identified as the preferred route alternative.

With information received during and after the public information day, including land owner comments, Route 1 was modified, and the overall scoring for this proposed route then indicated it as the best Alternative 2 route option for minimizing impacts.

2.6. Identification of the Preferred Alternative

Alternative 2 - Construct and Operate the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (Action) is TVA's preferred alternative. TVA would construct approximately 5.3 miles of 161-kV transmission line along proposed Route 1 (Figure 1-1). The proposed project would affect approximately 64 acres of new right-of-way. In cooperation with U.S. Fish and Wildlife Service (USFWS) and HRWA, TVA incorporated plans to ensure that impacts to Mill and Arrington creeks were minimized. After identification of the preferred route, affected property owners were mailed information showing the location of the preferred route on their property. Additional comments received from the property owners were reviewed, and where practical, changes were made to the preferred route prior to engineering and environmental field surveys. In addition to the adjustment to avoid the planned subdivision discussed in Section 2.5.5, the route was

modified to avoid a planned pond and adjust some structure locations. Following the survey of the proposed route, one property owner requested an additional change that would have moved the proposed transmission line further east on his property and would have also slightly affected an adjacent property owner. After all parties agreed to the change, this section was resurveyed and resulted in the final surveyed route (Figure 1-1).

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Introduction

This chapter describes the existing condition of the environmental resources and factors of the proposed project area that would affect or that would be affected by implementing the proposed action. The affected environment descriptions below are based on field surveys conducted from 2005 through 2006, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which the decision maker and the public can compare the potential effects of the alternatives under consideration.

3.2. Vegetation

The project area, consisting of the proposed right-of-way and access roads, lies within both the Outer Nashville Basin and Inner Nashville Basin ecoregions of the Interior Plateau (USEPA 2002a). The Outer Nashville Basin is comprised of rolling and hilly topography with slightly higher elevations than the Inner Nashville Basin. Much of the area is underlain by Ordovician limestone bedrock and the higher hills and knobs are capped by the chertier Mississippian-age formations and Devonian-age Chattanooga shale. Deciduous forest with pasture and cropland are the dominant land covers.

In contrast to the Outer Nashville Basin, outcrops of Ordovician-age limestone are more common the Inner Nashville Basin, and the generally shallow soils are redder and contain less phosphorus. The most characteristic hardwoods within the inner basin are a maple-oak-hickory-ash association. The cedar glades of Tennessee, a unique association of eastern red cedar, deciduous woodlands, and grasslands, contains many endemic species that are located primarily on limestones of the Inner Nashville Basin. Urban, suburban, and industrial land uses in the region are increasing.

Field surveys within the project area were conducted in October and December 2005 and April 2006. The proposed transmission line would cross pastures and cut through areas of fragmented forest. Existing plant communities include herbaceous vegetation, deciduous forests, and mixed evergreen-deciduous woodlands with exposed limestone rock.

Several invasive species occur within the proposed transmission line corridor including bush honeysuckle, Chinese privet, Japanese honeysuckle, Japanese stilt grass, Johnson grass, and tree of heaven. All of these species can spread rapidly and displace native vegetation, potentially adversely impacting native plant communities.

About 42 percent of the proposed right-of-way is dominated by pasture and other farmland. These areas are primarily composed of herbaceous vegetation consisting of tall fescue with foxtail grass, Johnson grass, and purple-top tridens. Along the fencerows, woody vegetation includes box elder, Chinese privet, hackberry, wild black cherry, and vines of heartleaf pepper vine, and Japanese honeysuckle.

Deciduous forests account for 25 percent of the proposed right-of-way and are composed primarily of an oak-hickory association dominated by chinquapin oak, Shumard's oak, southern red oak, bitternut hickory, mockernut hickory, and shagbark hickory. In addition, hackberry, honey locust, osage orange, white ash, and winged elm are found in the canopy. Blue ash, hop horn beam, pawpaw, slippery elm, sugar maple, and winged elm are common in the subcanopy layer with eastern red cedar scattered about. Common shrubs include aromatic sumac, glade privet, snowberry, and spicebush. Woody vines include cat briar, coral berry, crossvine, grape vine, Japanese honeysuckle, poison ivy, and saw briar. Within the herbaceous layer, several members of the sunflower family, such as asters, bonesets, and goldenrods are present along with black snakeroot, cutleaf grape fern, and ebony spleenwort.

Thirty-three percent of the proposed right-of-way is evergreen-deciduous woodlands. The woodlands occur along areas of exposed limestone and along the streambeds. The dominant vegetation is eastern red cedar and several oak species (Shumard's oak, white oak, chestnut oak). In addition to these species, American sycamore and box elder are common along the streambeds. Red maple, snowberry, and winged elm are common understory trees within the woodland with a similar shrub and herbaceous flora as the deciduous forest. Within the cedar glades (areas with exposed limestone), the shrub and herbaceous layers contain aromatic sumac, prickly pear cactus, stinging nettle, softhair marble seed, and stonecrop.

Within the evergreen–deciduous woodland is a distinct plant community, the globally rare red cedar-blue ash limestone woodland. This community occupies approximately 0.13 acres within the proposed right-of-way. This plant community, dominated by blue ash and eastern red cedar in the canopy and subcanopy, is considered to be of conservation concern and ranked G3 (Vulnerable - At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors) by NatureServe (2006a). This community is considered rare due to its restricted range in Tennessee where it is locally abundant in the central Nashville Basin and Cumberland Plateau areas. Other trees present in the relatively short-stature canopy or the open subcanopy include chinquipin oak, hackberry, redbud, slippery and winged elm. The shrub layer includes aromatic sumac, Carolina buckthorn, rusty black-haw, snowberry, and upland privet. Vines present are crossvine and round leaf greenbriar. The herbaceous layer contains Canada leaf cup, stonecrop, dayflower, Virginia wingstem, and ferns (purple cliffbrake and blunt-lobed cliff fern). Much of the ground cover is by foliose lichens (*Cladonia spp*.) rather than vascular plants. The red cedar-blue ash limestone woodland present within the project area is of high quality due to the size of the trees present and the lack of invasive species occurring within the area.

The plant communities observed along the proposed project route are common and representative of the region.

3.3. Wildlife

The proposed transmission line route would run through a landscape consisting of fragmented forests interspersed with limestone cedar glades, pasture, and residential areas. A diverse bird community was observed along the right-of-way including: wild turkey, killdeer, blue jay, Carolina wren, Carolina chickadee, hermit thrush, northern cardinal, and American goldfinch. Because field visits were conducted in October and

December, neotropical migrants were not observed. The proposed route traverses habitat suitable for red-eyed vireos, blue-winged warblers, northern parulas, orchard orioles, and other neotropical migrants. Mammals observed along the route include eastern cottontail, eastern mole, woodchuck, eastern chipmunk, eastern gray squirrel, and white-tailed deer. Habitat for the Alleghany woodrat occurs along the proposed transmission line route. Zigzag and long-tailed salamanders were found inhabiting springs in forested areas.

Limestone cedar glades provide habitat for numerous reptiles and amphibians. Studies at nearby Cedars of Lebanon State Park revealed the presence of 16 amphibians and 19 reptiles within or near the limestone cedar glade communities found in the park (Jordan 1986). Reptiles occurring in limestone cedar glades include eastern box turtle; northern fence lizard; five-lined, and broad-headed skinks; eastern garter and eastern hognose snakes; and others. Amphibians occurring in or near limestone cedar glades include marbled, spotted, green, and zigzag salamanders; American and Fowler's toads; and various frogs.

3.4. Threatened and Endangered Species

The TVA Natural Heritage database indicated that no federally and two state-listed terrestrial plant species are known from within 5 miles of the proposed transmission line route (Table 3-1). Two federally listed plant species are known from Williamson County, Tennessee (Table 3-1). During field surveys of the proposed project area conducted in October and December 2005 and April 2006, no federally or state-listed plant species or habitat for these species were present on lands that would be affected by the proposed activities. No designated critical habitat is located within the proposed project area.

No federally and two state-listed terrestrial animal species are known from Williamson County, Tennessee (Table 3-1). One additional species is considered uncommon by the Tennessee Natural Heritage Program, but does not have official status in Tennessee. No federally or state-listed terrestrial animal species were observed during field investigations in 2006.

The proposed project could affect portions of streams that flow through sections of three counties (Davidson, Rutherford, and Williamson). The TVA Natural Heritage database indicated that 12 federally or state-listed aquatic species are known to occur within these counties (Table 3-1). Three of these species, the Nashville crayfish, redband darter, and slenderhead darter, occur within 10 miles of the proposed transmission line route in the Mill and Arrington creek drainages.

Table 3-1. Federally and State-Listed Species Reported From the Proposed Project Area

Common name	Scientific name	Status[1]	
		Federal	State
Terrestrial Plants			
Duck River bladderpod	*Lesquerella densipila*	--	THR (S3)
Eggert's sunflower[2]	*Helianthus eggertii*	--	THR (S3)
Leafy prairie-clover	*Dalea foliosa*	END	END (S2S3)
Glade-cress	*Leavenworthia exigua* var. *exigua*	--	THR (S3)
Price's potato-bean	*Apios priceana*	THR	END (S2)
Birds			
Sharp-shinned hawk	*Accipiter striatus*	--	NMGT (S3B)
Cerulean warbler	*Dendroica cerulea*	--	NMGT (S3B)
Insects			
Tennessee snaketail	*Ophiogomphus acuminatus*	--	NOST (S2)
Crayfish			
Nashville crayfish[3]	*Orconectes shoupi*	END	END (S1)
Mussels			
Rabbitsfoot	*Quadrula cylindrica cylindrica*	--	NOST (S3)
Fish			
Lake sturgeon	*Acipenser fulvescens*	--	END (S1)
Blue sucker	*Cycleptus elongatus*	--	THR (S2)
Ashy darter	*Etheostoma cinereum*	--	THR (S2S3)
Redband darter[3]	*Etheostoma luteovinctum*	--	NMGT (S4)
Smallscale darter	*Etheostoma microlepidum*	--	NMGT (S2)
Tippecanoe darter	*Etheostoma tippecanoe*	--	NMGT (S1S2)
Silver lamprey	*Ichthyomyzon unicupsis*	--	NMGT (S2)
Bedrock shiner	*Notropis rupestris*	--	NMGT (S2)
Slenderhead darter[3]	*Percina phoxocephala*	--	NMGT (S3)
Southern cavefish	*Typylichthys subterraneus*	--	NMGT (S3)

-- = Not applicable

[1] Status codes: **END** = Endangered; **NMGT** = In Need of Management; **NOST** = no legal status, but tracked by the Tennessee Natural Heritage Program; **THR** = Threatened; **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences; or very few remaining individuals; or because of some special condition, where the species of some factor(s) making it vulnerable to extinction; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = rare or uncommon with 21 to 100 occurrences; **S4** = widespread, abundant, and apparently secure in the state, but with cause for long-term concern (more than 101 occurrences); **B** = ranking is for population breeding in state

[2] Eggert's sunflower was previously federally listed as threatened (USEPA 2005a)

[3] Aquatic species known to occur in the Mill Creek and Arrington Creek drainages within 10 miles of the proposed transmission line route

Sharp-shinned hawks typically nest in extensive tracts of fairly mature forest, but smaller woodlots and corridors of forest are occasionally used (Palmer-Ball 1996). This hawk tends to nest in pine trees (Wiggers and Kritz 1991), but there is at least one record of a nest in an eastern red cedar in Tennessee (Goodpasture 1956). A single nesting record occurs in Williamson County, approximately 20 miles from the proposed transmission line route. Along the route, red cedars are common and pines make up less than 5 percent of the tree species.

Cerulean warblers typically inhabit mature and old-growth deciduous forest, particularly in floodplains or other mesic areas (Nicholson 1997). In Middle and West Tennessee, breeding cerulean warblers are typically restricted to large tracts (hundreds to thousands of acres) of contiguous forest (Robbins, Fitzpatrick, and Hamel 1992). A single population of cerulean warblers is known from a ridge in Williamson County approximately 22 miles from the proposed route. Although moist, forested coves occur along the proposed transmission line route, these areas are heavily fragmented and unlikely to support cerulean warblers.

Tennessee snaketails are dragonflies that occur in and around clear, mostly shaded streams with sandy gravel bottoms (Dunkle 2000). The proposed transmission line route would cross over streams fitting this description.

The Nashville crayfish is found only in the main stem of Mill Creek, numerous large tributaries to Mill Creek, and some small second-order streams that eventually flow into Mill Creek in southern Davidson and Williamson counties, Tennessee (Withers 1998). Occurrences of this species are known from 1 mile of the northern terminus of the Clovercroft 161-kV Substation site. This species lives primarily under slabrock in areas with relatively little sediment in moderately flowing streams. It breeds during spring and is active during the summer (Miller and Hartfield 1985). Though this animal seems to be fairly tolerant of adverse conditions, its limited range renders it vulnerable to catastrophic events, and continuing urbanization may exceed the limits of the species' tolerance (O'Bara et al. 1985).

In the Mill Creek drainage the proposed transmission line would be located adjacent to one unnamed tributary stream identified on maps as perennial; however, it would be located more than 150 feet away. During the field survey, this stream was found to be dry in the area adjacent to the transmission line right-of-way. Most likely, the stream flow is located underground in this area. Additionally, field surveys identified one perennial stream, one intermittent stream, and four intermittent/wet-weather conveyance streams that would be crossed by the proposed transmission line that flow into this unnamed perennial tributary stream. Minimally established riparian zones or forest areas occur on both banks of four of these six streams. Of the remaining two, one is without a riparian zone, and the other has a riparian zone established on the north bank (Appendix VII). Suitable habitat for the Nashville crayfish was found within only one of these six streams (SMZ - 005). Additionally, crayfish of the same genus were located within this stream; however, a positive identification of the species was not possible on site.

The redband darter has been described as occurring only within the Duck River drainage, the Caney Fork River drainage, and Stones Creek (Etnier and Starnes 1993); however, Tennessee Wildlife Resources Agency reports collections from the headwaters of the Mill Creek drainage less than a mile from the northern terminus of the proposed transmission line (Appendix I). This darter prefers pools and sluggish runs in spring-fed streams of

moderate gradient over limestone bedrock, gravel, and cobble substrates (ibid). This habitat type is particularly vulnerable to man-made disturbances. Although no fish were observed during field surveys, a spring-fed perennial stream (SMZ-005) that drains to the unnamed Mill Creek tributary has habitat that could support the redband darter (Appendix VII). This stream currently has a 50-foot-wide forested riparian zone on the north bank.

In recent years, the slenderhead darter was collected primarily from the Duck, Stones, Harpeth and Red river drainages, with sporadic samples taken from the Tennessee and Cumberland rivers. The slenderhead darter is commonly found in gravel shoal areas of medium to large rivers with moderate to swift current (ibid). The most likely threats to the species are siltation, impoundment, and channelization (NatureServe 2006b). The closest known occurrences of this darter are within 10 miles (downstream of the Harpeth River); however, none of the intermittent streams that would be crossed by the proposed transmission line in the Arrington Creek drainage contained suitable habitat for the slenderhead darter.

3.5. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation (hydrophytes) adapted to saturated soil conditions are prevalent. Wetland substrates consist predominantly of undrained hydric soil—soils that are saturated with water and usually deprived of oxygen. Wetland examples include palustrine areas (described as lacking flowing water including marshes and swamps as well as bogs, fens, wet meadows, and floodplains) and lacustrine areas (described as lake-associated including freshwater marshes, aquatic beds, as well as lakeshores).

Wetland determinations along the proposed transmission line rights-of-way, construction material laydown area and access roads were conducted according to U.S. Army Corps of Engineers (USACE) standards that require documentation of hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997). Broader classification definitions of wetlands, such as the one used by the USFWS (Cowardin et al. 1979), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review.

The NWI data indicated that wetlands within the proposed Clovercroft 161-kV Transmission Line corridor are primarily limited to narrow, linear strips in the riparian zones of tributaries to Mill and Arrington creeks. NWI data did not indicate any large wetland concentrations along the proposed project corridor.

Field surveys were conducted on several occasions between October 2005 and February 2006. No jurisdictional wetlands were found in or adjacent to the proposed transmission line right-of-way or any of the proposed access roads and construction laydown areas.

3.6. Surface Water

The project area drains into the Harpeth River (Arrington Creek drainage) and the Cumberland River (Mill Creek drainage), both of which lie within portions of either the Inner or Outer Nashville Basin physiographic regions. Typical streams in these physiographic regions have clear water, moderate gradient, and low to moderate productivity. The softer limestones of the Highland Rim are permeated by dissolution channels creating a network

of caves that facilitates the dispersal of cave organisms and spring habitat (Etnier and Starnes 1993).

Precipitation in the project area averages about 54 inches per year with the wettest month in March at 5.8 inches and the driest month in October at 3.3 inches. Stream flow varies with rainfall and averages 21 inches per year. The average annual stream flow runoff is about 1.5 cubic feet per second per square mile of drainage area. Mean annual air temperature is about 57°F.

The Harpeth River in the project vicinity is classified by the state for domestic and industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife (TDEC 2004b). The remaining streams are classified for fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. The Harpeth River in Davidson County (about 50 river miles downstream of the project) is designated a State Scenic River because of its outstanding scenic and recreational value. It is threatened by development in Franklin and Bellevue. However, the segment of the Harpeth River within Williamson County is not designated as a Scenic River. The Harpeth River downstream of the project is on the state 303(d) list as impaired due to low dissolved oxygen and siltation from pasture grazing and removal of riparian vegetation (TDEC 2004c). Mill Creek is listed due to nutrients, siltation, and organic enrichment/low dissolved oxygen from minor municipal point sources and livestock in the stream.

3.7. Aquatic Ecology

The Mill Creek drainage originates in mixed forest and agricultural lands; however, a large portion of it lies in urban/suburban environments downstream of the project area in southeast Davidson County. Williamson County and the southeastern region of Davidson County are currently undergoing rapid growth and urbanization. As a result, siltation and channel modification have become major concerns in this area. Arrington Creek has not been found to be impaired by TDEC, but sections of the Harpeth River downstream of the confluence with Arrington Creek are impaired partially due to excessive siltation (TDEC 2004a).

Field surveys were conducted to determine the presence of watercourses and aquatic habitat types in the area affected by the proposed transmission line. A total of 38 watercourse crossings along the proposed transmission line right-of-way or access roads were located. These consisted of 4 perennial streams, 9 intermittent streams, 4 intermittent/wet-weather conveyances and 21 wet-weather conveyances (Appendix VII). The riparian zone is forested at 11 of the 17 locations where the proposed transmission line would cross intermittent and perennial streams. The riparian zones of an additional 2 proposed crossings of intermittent and perennial streams have a mix of shrubs and trees, and 4 proposed crossings are vegetated with grasses and forbs. Descriptions of the fish and invertebrate communities in project area streams are not available and most of the streams were dry when they were surveyed for this project.

3.8. Managed Areas

The TVA Natural Heritage database indicated that no managed areas and/or ecologically significant sites are within 3 miles of the proposed project. However, the proposed action is within 3 miles of a Nationwide Rivers Inventory (NRI) stream.

The Harpeth River is listed on the NRI between River Mile 6 near Jackie Branch on the Cheatham/Dickson County line to River Mile 121 at the confluence with Puckett Branch and Concord Creek. The National Park Service recognizes this stream for its scenic, recreational, geologic, fish and wildlife, historic, and cultural values. It is noted as a stream rich in history and of archaeological significance with impressive, carved bluffs. The river is located 1.6 miles south of the proposed transmission line tap point in the East Franklin-Triune 161-kV Transmission Line.

3.9. Recreation

Recreation in the project area is largely informal and dispersed. Primary activities include walking, hunting, off-road vehicle use, and wildlife observation and occur primarily on privately owned land. There are no developed public recreational facilities in the project area.

3.10. Floodplains

The proposed transmission line would cross the identified floodplain of Arrington Creek along with several minor floodplain areas in Williamson County, Tennessee. The existing Triune Substation and the site of MTEMC's proposed Clovercroft substation are not located within the 100-year floodplain.

3.11. Groundwater

The project area is underlain by Ordovician-aged aquifers in the Interior Low Plateaus Physiographic Province. These carbonate rocks are the principal aquifers in large areas of central Tennessee and are part of the Central Basin aquifer system. The carbonate rock aquifers consist of almost pure limestone and minor dolostone and are interlayered with confining units of shale and shaly limestone. Limestone is susceptible to erosion, which produces fissures, sinkholes, underground streams, and caverns, forming vast underground karst areas.

The middle Ordovician Stones River Group contains the most important carbonate-rock aquifers in the project area. The calcareous siltstones of the middle Ordovician Nashville Group yield small volumes of water, but these units are not considered to be principal aquifers. The lower Ordovician Knox Group is a major aquifer where dolostone contains freshwater. In a large area in central Tennessee, the upper parts of these aquifers contain freshwater and underlie a thin layer of Mississippian limestone and/or the Chattanooga Shale of Mississippian and Devonian age (Lloyd and Lyke 1995).

Precipitation is the primary source of recharge in the Interior Low Plateaus Province. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs is common throughout the Interior Low Plateaus Province. However, the volume of solution openings in the Ordovician limestones is estimated to be less than 0.5 percent of the total rock volume (ibid).

The quality of the water in the carbonate aquifers in the Ordovician rocks is considered hard and contains high concentrations of dissolved solids, chlorine, and iron. These concentrations, however, are equal to or less than USEPA's secondary maximum contaminant levels for drinking water. The quality of the water generally is adequate for domestic use, or it can be treated and made adequate for most uses. Contaminated and turbid waters are common problems for the users of water from the carbonate aquifers in Ordovician rocks. The thin soil and residuum and the presence of solution features, such as sinkholes, swallow holes, and solution-enlarged fractures, allow water from the land surface to recharge the aquifer directly and rapidly. Contaminated and sediment-laden waters can then spread through a system of interconnected solution openings, which can eventually reach wells and springs (ibid).

The proposed project is located within karst terrain. Karst systems are readily susceptible to contamination as the waters can travel long distances through conduits with no chance for the natural filtering processes of soil or bacterial action to diminish the contamination. In unconfined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions such as storm events (TDEC 2002a). Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those that are under the direct influence of surface water. Although no sinkholes were identified along the proposed right-of-way, the northern section from Jenkins Hill to the Clovercroft 161-kV Substation site is located within a large state-designated source water protection area. This designation places the proposed project area within a recharge area for a public drinking water source. Public water for Williamson County is supplied by both surface water and groundwater sources (TDEC 2002b). Privately owned wells supply water to area schools and a campground (USEPA 2005b). Residential wells may also occur near the project area.

3.12. Visual Resources

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between 1 and 4 miles from the observer, objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section with additional details in Chapter 4.

The proposed 5.3-mile transmission line route between the tap point in the existing East Franklin-Triune 161-kV Transmission Line and the planned Clovercroft 161-kV Substation would pass through a variety of middle Tennessee countryside. The tap point would be located along SR 96 approximately 2.5 miles west of Triune. The area is mainly an open expanse of farmland interspersed with woodlands to the north and west. SR 96 is a major

thoroughfare between Murfreesboro to the east and Franklin to the west. There are two homes under construction to the southeast of the tap point adjacent to SR 96. Motorists on SR 96 currently have foreground views of the existing East Franklin-Triune 161-kV Transmission Line.

The transmission line route would cross mainly low-lying open pastureland from the tap point to Osburn Road approximately 1.5 miles to the north. Residents in this area have foreground views of existing wood utility poles along the road right-of-way. Traffic is light to moderate. Scenic attractiveness is common. Scenic integrity is low.

From Osburn Road, the route would continue north, traversing steep terrain just east of Chinquapin Hill and farther north over Jenkins Hill. Vegetation is extremely dense along this section of the proposed route and most access roads are unimproved. From Jenkins Hill, the route would follow a low-lying area that forms the upper reaches of the drainage basin for Mill Creek to the north. The transmission line would connect to the new Clovercroft 161-kV Substation, located along the south side of Clovercroft Road approximately 0.9 mile southwest of Nolensville. There are several residents to the east and west along Clovercroft Road.

3.13. Cultural Resources

The Central Basin of Middle Tennessee has been an area of human occupation for the last 12,000 years. Human occupation of the area is generally described in five broad cultural periods: Paleo-Indian (11,000-8000 BC), Archaic (8000-1600 BC), Woodland (1600 BC-AD 1000), Mississippian (AD 1000-1700), and Historic (AD 1700- to present). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. Williamson County was created from part of Davidson County in 1799. Like the other counties in the fertile Central Basin, Williamson County thrived on an agricultural economy. Phosphate mining became a profitable pursuit during the early 1890s. The county remained mostly agrarian through the 1960s, but during the late-20th century, urban sprawl from nearby Nashville forever changed the landscape of the area (Crutchfield 1998).

The archaeological Area of Potential Effect (APE) for the project was determined as all areas in which land-disturbing activities would take place, which include the proposed 100-foot-wide, 5.3-mile-long transmission line corridor, an approximate 1-acre proposed substation site, laydown area, and nine access roads. The historical/architectural APE includes a 0.5-mile area surrounding the corridor for a total survey area of approximately 5.3 square miles. Prior to conducting the Phase I field survey, a preliminary records search indicated that no archaeological sites and five architectural properties (WM-1042, 1082, 1083, 1092, and 920) are located directly within the project APE. None of these properties have been previously evaluated for the NRHP by the Tennessee State Historic Preservation Officer (SHPO). The Civil War-era Triune Fortification Complex, listed on the NRHP, is about 2 miles from the proposed transmission line and outside of the APE.

The archaeological survey conducted between November and December 2005 (Wampler 2006) identified four previously unrecorded archaeological sites (40WM401-404). These sites are considered ineligible for listing on the NRHP because they are all undetermined

prehistoric sites that contain a very low density of artifacts. Additionally, the deposits are very shallow and have been previously disturbed.

The historical/architectural survey conducted in November 2005 (ibid) identified two previously unrecorded properties (HS-1 and HS-2) and reevaluated two previously recorded historic properties (WM-1042 and 920). These four buildings are ineligible for listing on the NRHP due to the loss of integrity caused by alterations and/or damage. Previously surveyed properties WM-1082 and 1083, although located within the 0.5-mile APE, are situated at the base of low hills that place them outside the visual line-of-sight to the proposed transmission line. As a result, these properties were not reevaluated for the current undertaking. One previously inventoried property (WM-1092) has been destroyed since its initial recordation.

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CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment form the detailed scientific and analytic basis for the summary comparisons presented in Chapter 2, Section 2.2 Description of Alternatives.

Section 2.2 contains by alternative the predicted attainment and nonattainment of the purpose and need defined in Chapter 1. Chapter 4 presents the detailed predicted effects of implementing Alternative 1 – Do Not Construct the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (No Action) and Alternative 2 - Construct and Operate the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (Action).

4.1.1. Alternative 1 – Do Not Construct the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (No Action)

Under this alternative, TVA would not construct and operate the proposed transmission line, or take other actions to improve the power supply situation in the MTEMC project area. None of the impacts resulting from the construction and operation of the proposed facilities described below would occur as a result of TVA's actions. In general, however, factors outside of TVA's control would continue to influence natural and cultural resources in the project area. These include reasonable foreseeable private and public activities associated with industrial and residential development and associated infrastructure.

Additionally, the implementation of Alternative 1 as discussed in Section 2.2.1 would not address the reliability or capacity concerns in the MTEMC service area. As a result, the potential for impacts resulting from the actions that MTEMC could take to address these concerns are considered to be equal or greater to Alternative 2. Therefore, the effects of implementing Alternative 1 are the same as the effects of Alternative 2 – Construct and Operate the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (Action).

4.1.2. Alternative 2 - Construct and Operate the East Franklin-Triune 161-kV Transmission Line Tap to Clovercroft 161-kV Substation (Action)

Under this alternative, TVA would implement the proposed project. The predicted effects of the construction, operation, and maintenance of the proposed 5.3-mile transmission line are described in this chapter.

4.2. Vegetation

Under the Action Alternative, approximately 31 acres of forest would be converted to, and maintained as, early successional habitat within the project right-of-way. Currently, about 42 percent of the proposed transmission line right-of-way and access roads are maintained as pasture or cropland and the effects of transmission line construction and operation in these habitats would be minimal. Although the right-of-way would transect a very small

portion (0.13 of 1.96 acres) of a globally ranked G3 red cedar-blue ash limestone woodland plant community, there would be no significant impact to the community as a whole since it is locally abundant and commonly found in the Nashville Basin region of Tennessee. The loss of this small portion of woodland vegetation would not contribute to any negative impacts to this uncommon plant community. Therefore, any impact to terrestrial ecology as a result of the proposed project is expected to be minor and regionally insignificant.

4.3. Wildlife

Most of the forests that would be impacted by the proposed project contain intermittent streams, creeks, woody debris, and other microhabitats suitable for a variety of wildlife. Although many individuals inhabiting areas along the proposed route would move to adjacent habitat during construction activities, less mobile animals would likely be destroyed.

Woody vegetation occurring in limestone cedar glades would be cut wherever the proposed transmission line crosses over this community. This would open the glades to more sunlight, which may benefit reptiles but may make the area less tolerable to some amphibians. Amphibians are primarily found in moist areas surrounding glades; therefore, the proposed project would result in minimal and temporary impacts to amphibians. Overall, no significant impacts are anticipated to wildlife as a result of the proposed project.

4.4. Threatened and Endangered Species

The proposed transmission line corridor is not expected to result in adverse impacts to any federally or state-listed species.

No federally listed or state-listed plant species were found during field surveys of the project area in 2005 and 2006. No impacts to federally listed or state-listed plant species are anticipated as a result of the proposed action.

No federally or state-listed terrestrial animals were encountered during field surveys in 2005 and 2006. Forested woodlots provide habitat for sharp-shinned hawks, but the lack of pines in these woodlots reduce sharp-shinned hawk nesting potential. Few pines would have to be removed during the construction of the proposed transmission line route. The proposed project would not result in direct, indirect, or cumulative adverse impacts on sharp-shinned hawks or their breeding habitat.

Cerulean warblers are not known from the project area. Due to the current fragmentation of forests, lack of high-quality cerulean warbler habitat, and the small size of forested stands, ceruleans warblers likely only migrate through the vicinity. The proposed project would not result in direct, indirect, or cumulative adverse impacts to cerulean warblers.

With the use of TVA BMPs as outlined in Muncy (1999), impacts related to the construction, operation, and maintenance of the proposed Clovercroft 161-kV Transmission Line on Tennessee snaketail habitat would be insignificant.

Field surveys were conducted for the presence of watercourses and aquatic habitat types in the area affected by the proposed transmission line. One federally and two state-listed aquatic animals are known to occur within 10 miles of the proposed project with two of

these (Nashville crayfish and redband darter) additionally known to occur in the Mill Creek drainage within a mile north of the Clovercroft 161-kV Substation.

Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et al. 2002). Pollution resulting from silt deposits has been observed to destroy or greatly diminish crayfish populations in many localities in the eastern part of the US. Moreover, it is believed that in streams carrying heavy silt loads, the welfare of crayfishes in them is seriously threatened. Silt in suspension is not necessarily detrimental to crayfish populations; it is the effect of the destruction of the habitat (obliteration of retreats under rocks and debris and smothering of burrows) rather than the direct effect on the crayfish itself (Hobbs and Hall 1974).

Without stream bank protection, soil-disturbing activities and vegetation removal adjacent to tributaries of Mill Creek could contribute to the siltation and nutrient enrichment already present within this stream, resulting in direct and cumulative impacts on nearby populations of Nashville crayfish and redband darters. The habitat type preferred by the redband darter was located within one of the perennial streams that would be crossed by the transmission line (Appendix VII); however, no fish were observed at this site (SMZ-005) during field surveys. Removal of the trees in the riparian zone located on the north bank of this stream would be required for the width of the right-of-way. The south bank riparian consists of 5 feet of brush that would not require removal.

The proposed transmission line right-of-way would be located a minimum of 150 feet from the unnamed perennial tributary to Mill Creek, and no disturbance would occur to the existing riparian zone of this stream. Given the descriptions of the preferred habitat for Nashville crayfish presented by Miller and Hartfield (1985), field observations suggested that only one of the streams adjacent to or crossed by the proposed transmission line (SMZ - 005) in the Mill Creek system is likely to support populations of this crayfish. Crayfish of the same genus as the Nashville crayfish are present in this stream. However, positive species identification was not possible in the field. Because Nashville crayfish could be present in this stream, TVA will implement several stream protection measures described below, in addition to routine BMPs, in this area to reduce potential impacts.

Although there are no records of sensitive aquatic species occurring in Arrington Creek, the slenderhead darter has been collected in the Harpeth River less than 10 miles downstream of the southern terminus of the project. Soil-disturbing activities and removal of riparian vegetation adjacent to tributaries of Arrington Creek could exacerbate the problem and have a cumulative effect on downstream populations of slenderhead darters within the Harpeth River. The surveyed route would cross eight intermittent and three perennial streams in the Arrington Creek drainage; however, given the habitat preferences of the slenderhead darter, it is not likely that this species would occur at or near any of the surveyed crossings.

With the exception of the stream identified as SMZ - 005, it is unlikely that any direct effects would occur as a result of the proposed action due to the nature of the proposed project and the probable absence of federally and state-listed aquatic animal species in the proposed transmission line right-of-way. However, indirect and cumulative effects are possible. To minimize any direct, indirect, or cumulative effects as a result of the proposed project, all construction and maintenance work would be conducted following the requirements and recommendations presented in TVA’s guidelines for environmental

protection during transmission line construction and maintenance (Muncy 1999). In addition, for the protection of the listed species the following commitments would be implemented:

- Category A protection would apply in the Mill Creek drainage to the four intermittent/wet-weather conveyances that drain to the unnamed perennial Mill Creek tributary stream. A 50-foot SMZ would be implemented at these crossings.

- Category B protections would apply in the Mill Creek drainage to the unnamed perennial stream (SMZ – 005) and one intermittent tributary (SMZ – A001) crossed by the proposed transmission line. As defined in Muncy (1999), a 100-foot SMZ would be established at SMZ – 005 and a 50-foot SMZ at crossing SMZ – A001 (Appendix VII). As soon as is practicable after clearing, these SMZs will be replanted with low-growing woody vegetation.

- No equipment would be allowed to enter the unnamed perennial stream (SMZ – 005), and no temporary or permanent vehicle crossings would be constructed in the stream channel at the site of the transmission line crossing. If a stream crossing is needed, a temporary bridge would be employed. No instream disturbance would be allowed, and stream bank disturbance would be limited to that needed to accomplish the crossing. All standard BMPs to prevent runoff into the stream would be employed if a vehicle crossing is needed.

Short-term direct, indirect, or cumulative impacts related to the construction, operation and maintenance of the proposed transmission line on federally and state-listed aquatic animal species in the proposed project area are possible. However, with proper implementation of appropriate stream protection requirements, use of BMPs, and adherence to the recommended commitments, impacts as a result of the proposed project are anticipated to be insignificant. The USFWS has concurred with TVA's determination that the proposed undertaking is not likely to adversely affect any federally listed species (Appendix I).

4.5. Wetlands

No jurisdictional wetlands were observed along the proposed Clovercroft 161-kV Transmission Line right-of-way or any of the proposed access roads and construction laydown area. Therefore, the proposed transmission line would have no effect on jurisdictional wetlands.

According to NWI data, the majority of the nonjurisdictional wetland areas along the proposed transmission line right-of-way are concentrated within the riparian areas associated with Mill and Arrington creeks. With implementation of BMPs (Muncy 1999), clearing of the proposed right-of-way would have an insignificant impact on nonjurisdictional (i.e., NWI) wetlands in the project corridor.

4.6. Surface Water

Soil disturbances associated with access roads or other construction activities can potentially result in adverse water quality impacts. Stream bank erosion and sedimentation can clog small streams, increase nutrient inflows, and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, algal growth,

dissolved oxygen depletion, and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. Right-of-way maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts are anticipated.

4.7. Aquatic Ecology

Aquatic life could be affected by the proposed action either directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the transmission line corridor. Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of instream habitat, and increased stream temperatures. Other potential construction and maintenance impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams.

Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize erosion and subsequent sedimentation in streams.

Standard Stream Protection (Category A) would apply to the four intermittent/wet-weather conveyances that drain to the unnamed perennial Mill Creek tributary stream. Category A protection would also apply to all intermittent and perennial streams within the Arrington Creek drainage. This category of protection is based on the variety of species and habitats that exist in perennial and intermittent streams and the state and federal requirements to avoid harming these aquatic ecosystems. The width of the SMZ is determined by the category of protection and the slope of the stream banks (ibid).

Protection of Important Permanent Streams (Category B), as outlined in Muncy (1999) and the *Tennessee Valley Authority Transmission Construction Guidelines Near Streams* (Appendix V) would apply to one perennial (SMZ - 005) and one intermittent stream crossing (SMZ - A001) in the unnamed Mill Creek tributary based on the potential for adverse impacts related to the construction and maintenance of the proposed transmission line. The category of protection is used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the possibility of the presence of a federally listed as endangered species within the streams and downstream of

the proposed project. The width of the SMZ is determined by the category of protection and the slope of the stream banks (ibid). Category B protections were assigned for the following reasons:

- Protection of Nashville crayfish habitat
- Protection of spring-fed runs that are potential habitat for the redband darter

With proper implementation of the appropriate stream protection requirements and the use of standard BMPs as outlined in Muncy (1999), all potential direct, indirect, or cumulative impacts to aquatic communities or habitat as a result of the construction, operation, and maintenance of the proposed transmission line would be insignificant.

4.8. Managed Areas

No managed areas and/or ecologically significant sites are within 3 miles of the proposed project; no adverse direct, indirect, or cumulative effects to natural areas are anticipated. Additionally, because the distance is sufficient, no adverse direct, indirect, or cumulative effects are anticipated to the NRI-listed segment of the Harpeth River as a result of the proposed action.

4.9. Recreation

No developed recreational facilities would be affected by the proposed project. Any impacts to other public recreation resources, facilities, and activities are anticipated to be temporary and insignificant.

4.10. Floodplains

The proposed transmission line would cross several floodplain areas in Williamson County, Tennessee. Consistent with EO 11988, an overhead transmission line and related support structures are considered a repetitive action in the 100-year floodplain. The construction of the support structures for the transmission line would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Proposed activities at the Triune Substation would not involve construction within the 100-year floodplain, which would be consistent with EO 11988. Some of the access roads would involve construction in the 100-year floodplain. Any necessary improvements to the roads would be done in such a manner that upstream flood elevations would not be increased. The planned Clovercroft 161-kV Substation would be located outside of the 100-year floodplain.

4.11. Groundwater

Although located within karst terrain, no sinkholes were identified along the proposed right-of-way. A section of the proposed right-of-way, however, is located within a large state-designated source water protection area. USEPA (2002b) recommends the avoidance of

application of both herbicides and fertilizers within the source water protection area to avoid possible impacts to drinking water supply. However, some source water protection areas are too large to use avoidance as a practical measure to protect these drinking water sources. To minimize possible contamination to this groundwater source, the use of fertilizers and herbicides during revegetation and maintenance activities would be considered with caution before application and would be applied according to the manufacturers' label. Herbicides with groundwater contamination warnings would not be used along the north section of the proposed right-of-way. Additionally, BMPs as described in Muncy (1999) would be used to avoid contamination of groundwater during construction in the project area. BMPs would be used to control sediment infiltration from storm water runoff. With these precautions and the use of BMPs, impacts to groundwater from the proposed action would be insignificant.

4.12. Visual Resources

Visual consequences are examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The foreground, middleground, and background viewing distances were previously described in Section 3.11.

Visual/Aesthetic impacts resulting from the construction and operation of the proposed transmission lines and associated right-of-way would have minor impacts. Additional features associated with new poles and locations for the proposed 161-kV transmission line would increase the number of adversely contrasting elements in the rural landscape. These incremental changes would not be individually significant, but together would add to existing disruptions of visual coherence and harmony.

At the tap point along SR 96, motorists would have views of the new transmission line as it crosses open pastureland north toward Osburn Road. These views would be brief and visually similar to views of the existing East Franklin-Triune 161-kV Transmission Line running parallel to SR 96. For residents near the proposed tap point, new poles and structures would contribute to an increase in the amount of visual clutter seen in the foreground landscape.

At Osburn Road, the transmission line would cross mainly open pastureland. Several residents to the east would have foreground views of the new transmission line before it quickly disappears into steep, heavily vegetated terrain to the north. From this point, views of the transmission line would be limited mainly to individuals hiking or utilizing off-road vehicles. For motorists along US 31A to the east, views would be obscured by higher ridgelines and by distance. Visual impact decreases as distance increases. The influence of the natural landscape on the transmission lines and their structures in these areas, as perceived in the background distances, greatly decreases impacts on natural character.

At the planned Clovercroft 161-kV Substation site along Clovercroft Road, several residents to the east and west would have views of the new transmission line as it enters the substation. These views would be partially obscured by vegetation in the immediate foreground on the south side of Clovercroft Road. Visual impacts of the new transmission

line for these residents would likely be insignificant, especially when compared to the visual impacts of MTEMC's Clovercroft substation.

Operation, construction, and maintenance of the proposed transmission line would be visually insignificant. There would be some minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the proposed 100-foot right-of-way and laydown areas have been restored through the use of TVA's standard BMPs (Muncy 1999). Therefore, no significant visual impacts are anticipated as a result of the proposed project.

4.13. Cultural Resources

Five previously recorded historic/architectural properties (WM-1042, 1082, 1083, 1092, and 920), four previously unrecorded archaeological sites (40WM401-404), and two previously unrecorded historic/architectural properties (HS-1 and HS-2) were identified in the project APE. Sites WM-1042, WM-920, HS-1, and HS-2 are ineligible for listing on the NRHP due to loss of integrity caused by alterations and/or damage. WM-1092 has been destroyed and WM-1082 and 1083 are situated at the base of low hills that place them outside the visual line-of-sight to the proposed transmission line. 40WM401 – 40WM404 are all undetermined prehistoric sites that contain very low-density of artifacts and the deposits are very shallow and previously disturbed and therefore considered ineligible for listing on the NRHP. The Tennessee SHPO has concurred with TVA's determination that the proposed undertaking does not have the potential to affect any historic properties that are eligible for listing or are currently listed on the NRHP.

4.14. Post-Construction Impacts

4.14.1. Electric and Magnetic Fields

TVA recognizes there is public concern about whether any adverse health effects are caused by electric and magnetic fields (EMF) that result from generation, transmission, distribution, and use of electricity. Many scientific research efforts and other studies examining the potential health and other effects of EMF have been and are being done. TVA is aware of, and ensures that it stays aware of, published research and study results and directly supports some of the research and study efforts.

Studies, interpretations, and research to date are far from conclusive about potential associations between EMF and possible health impacts. A few studies have been interpreted as suggesting a weak statistical relationship between EMF and some rare forms of cancer. During the summer of 2001, the International Association for Research on Cancer reviewed available epidemiological studies and concluded that childhood leukemia appears to be associated with magnetic fields but that there was not a cause-and-effect relationship. It was concluded that the risk is small but may in some circumstances of higher exposure result in one type of childhood leukemia. The association also concluded that electric fields do not have a connection with cancer.

However, equal or greater numbers of similar studies show no association or cannot reproduce data interpreted as demonstrating an association. No laboratory research has found cause-and-effect health impacts from EMF and certainly none that are adverse.

Neither has any concept of how these fields could cause health effects achieved scientific consensus.

There is also no agreement in the scientific or EMF research community as to what if any electric or magnetic field parameters might be associated with potential health effects. There are no scientifically or medically defined safe or unsafe field strengths, although state regulatory bodies in Florida and New York have established edge of right-of-way magnetic field strength limits for 230-kV and larger power transmission lines.

TVA has analyzed and continues to analyze the fields associated with its typical line designs using the best available models and has measured actual fields for a large number of locations along its transmission line easements. Both model data and measurements show that the field strengths for TVA transmission lines are well within Florida and New York limits. Based on such models, expected field strengths for the proposed lines discussed in this document would also be within those existing state guidelines.

TVA's standard location practice has the effect of minimizing continuous public exposures to transmission line EMF. The transmission line route selection team uses a constraint model that place a 300-foot-radius buffer around occupied buildings, except schools, for which a 1,200-foot buffer is used. The purpose of these buffers is to reduce potential land-use conflicts with yard trees, outbuildings, and ancillary facilities and potential visual impacts as well as exposures to EMF. Although not absolute location constraints, these buffers weigh heavily in location decisions, influencing selection of route options and alignments. Because EMF diminishes quickly with distance from the conductors, the routing of transmission lines using constraint buffers effectively reduces potential continuous public exposure to EMF. Crossing under lines or otherwise being near them for short periods may increase overall EMF exposure, but only minutely.

4.14.2. Other Impacts

No significant impacts are expected to result from the relatively short-term activities of construction, such as noise, solid waste, etc. Appendices III and IV contain procedures for dealing with these issues.

4.15. Irreversible and Irretrievable Commitment of Resources

The materials used for construction of the proposed facilities would be committed for the life of the facilities. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, but the metals used in equipment, conductors, and supporting steel structures could be recycled. The useful life of steel-pole transmission structures is expected to be at least 60 years.

The rights-of-way used for the transmission lines would not be irreversibly committed and could be returned to other uses upon retirement of the line. In the interim, compatible uses of the right-of-way could continue.

Forest products and related wildlife that might have grown on the presently forested portions of the right-of-way would be lost for the life of the project. No locally or regionally significant lost forest or agricultural production would be expected.

4.16. Unavoidable Adverse Effects

After completion of the transmission line:

- Trees would not be permitted to grow within the right-of-way or to a determined height adjacent to the right-of-way that would endanger the transmission line.
- Clearing and construction would result in the disruption of some wildlife, but no permanent habitat changes would occur except in the wooded areas previously described.
- Any burning of cleared material would result in some short-term air pollution.
- Clearing, tree removal, and excavation for pole erection would result in a small amount of localized siltation.
- Transmission line visibility would be minimized through the location; however, there would be some degree of visual effect on the landscape in the project area.

4.17. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The construction and operation of the proposed transmission line would supply electricity to meet the present and foreseeable expected loads at the planned Clovercroft 161-kV Substation. This would be accomplished by a localized shift of a small amount of land to use for electric power transmission. If, during the useful life of the transmission line, it is no longer needed or technology renders it obsolete, it can be removed with relatively little difficulty. The land encumbered by the right-of-way could be returned to its previous use or used for other purposes.

The principal change in short-term use of the right-of-way would be the exclusion of trees and permanent structures. The amount of forest being lost is approximately 31 acres within the right-of-way area, and areas removed from production are dispersed along the length of the transmission line. The right-of-way cannot support building construction for the life of the project, but the social and economic benefits of the project should outweigh this small loss.

4.18. Summary of TVA Commitments and Proposed Mitigation Measures

To support the preceding conclusions, TVA would commit to the following additional actions to avoid or mitigate possible environmental impacts:

<u>Protection of Aquatic Resources</u>

- All intermittent and perennial watercourse crossings within the Arrington Creek drainage would be designated as Category A, Standard Stream Protection, as outlined in Muncy (1999). Category A would also apply in the Mill Creek drainage to the four intermittent/wet-weather conveyances that drain to the unnamed perennial Mill Creek tributary stream. A 50-foot SMZ would be implemented at these crossings (Appendix VII).

- Category B protections would apply in the Mill Creek drainage to the unnamed perennial stream (SMZ – 005) and one intermittent tributary (SMZ – A001) crossed by the proposed transmission line. As defined in Muncy (1999), a 100-foot SMZ would be established at SMZ – 005 and a 50-foot SMZ at crossing SMZ – A001 (Appendix VII). As soon as is practicable after clearing, these SMZs would be replanted with low-growing woody vegetation.

- No equipment would be allowed to enter the unnamed perennial stream (SMZ – 005), and no temporary or permanent vehicle crossings would be constructed in the stream channel at the site of the transmission line crossing. If a stream crossing is needed, a temporary bridge would be employed. No instream disturbance would be allowed, and stream bank disturbance would be limited to that needed to accomplish the crossing. All standard BMPs to prevent runoff into the stream would be employed if a vehicle crossing is needed.

- Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line construction and operation (Appendix VII) would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize erosion and subsequent sedimentation in streams.

<u>General Best Management Practices for Clearing, Construction, and Maintenance</u>

- TVA practices detailed in Appendices III, IV, V, and VI, as well as in TVA's Best Management Practices guide (Muncy 1999) would be used during clearing, construction, and maintenance. EO 13112 directs all federal agencies to prevent and control, to the extent practicable, the introduction and spread of invasive species resulting from their activities. TVA would use reseeding mixes that are certified free of invasive, exotic plant seeds when replanting disturbed areas.

- The retired three-pole structure at the Triune 161-kV Substation would be reused by TVA.

- The wooden three-pole structure currently located at the East Franklin-Triune 161-kV Transmission Line tap point would be given to local property owners for restrictive reuse or disposed of according to TVA procedures. Some epoxy arms may contain a lead pin, so the epoxy arms would be checked for lead. Any lead present would be removed and placed in a separate bin for recycle; the epoxy arms would be sent to a disposal facility. The insulators would be sent to a disposal facility, and the retired conductor would be recycled.

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CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

John T. Baxter

Position:	Biologist - Aquatic Endangered Species
Education/Experience:	M.S. and B.S., Zoology. 16 years in Protected Aquatic Species Monitoring, Habitat Assessment, and Recovery; 6 years in Environmental Review
Involvement:	Aquatic Endangered Species

W. Nannette Brodie

Position:	Environmental Specialist, Professional Geologist
Education/Experience:	B.S., Geology, B.S., Environmental Science; 12 years in surface water quality and groundwater assessments; Registered Professional Geologist
Involvement:	Groundwater

Patricia B. Cox

Position:	Botanist
Education/Experience:	Ph.D. Botany, 28 years experience in plant taxonomy at university; 2 years in botanical field assessments
Involvement:	Vegetation, Threatened and Endangered Species

Thomas Cureton Jr.

Position:	M.S. Civil Engineering - Siting and Environmental Design
Education/Experience:	31 years in power plant design and inspection, and transmission line and substation siting
Involvement:	Project and Siting Alternatives

Travis H. Henry

Position:	Senior Zoologist
Education/Experience:	M.S., Zoology; 17 years in terrestrial endangered species
Involvement:	Wildlife, Threatened and Endangered Species

John M. Higgins

Position:	Water Quality Specialist
Education/Experience:	Ph.D., Environmental Engineering, B.S. and M.S., Civil Engineering; 31 years in water resource management; Registered Professional Engineer
Involvement:	Surface Water

Clint Jones

Position:	Biologist - Aquatic Ecologist
Education/Education:	B.S., Wildlife and Fisheries Science. 15 years in environmental consultation and fisheries management
Involvement:	Aquatic Ecology

Todd C. Liskey

Position:	Senior Environmental Engineer - Siting and Environmental Design
Education/Experience:	B.S., Civil Engineering, M.B.A; 12 years in transmission line planning and preparation of environmental review documents
Involvement:	Purpose of and Need for Action; Alternatives Including Proposed Action

Anita E. Masters

Position:	Senior NEPA Specialist
Education/Experience:	M.S., Biology/Fisheries, B.S., Wildlife Management; 20 years in Fisheries Biology/Aquatic Community and Watershed Assessments, Protected Aquatic Species and Habitat Monitoring, and NEPA Compliance
Involvement:	NEPA Compliance and Document Preparation

Roger A. Milstead

Position:	Floodplain Specialist
Education/Experience:	B.S., Civil Engineering; 30 years experience in floodplain and environmental evaluations. Registered Professional Engineer
Involvement:	Floodplains

W. Chett Peebles

Position:	Senior Landscape Architect
Education/Experience:	Bachelor of Landscape Architecture; 18 years experience in site planning and visual assessment. Registered Landscape Architect
Involvement:	Visual Resources

Richard L. Pflueger

Position:	Land Use and Recreation Specialist
Education/Experience:	M.B.A., B.S., Accounting; 29 years experience in recreation and economic development
Involvement:	Recreation

Kim Pilarski

Position:	Senior Wetlands Biologist
Education/Experience:	M.S., Geography, Minor Ecology; 12 years experience in wetlands assessment and delineation
Involvement:	Wetlands

Marianne M. Shuler

Position:	Archaeologist Technician
Education/Experience:	B.A., Religion emphasis Middle Eastern Archaeology; 6 years experience in archaeology
Involvement:	Cultural Resources

Jan K. Thomas

Position:	Contract Natural Areas Specialist
Education/Experience:	M.S., Human Ecology. 10 years in Health and Safety Research, Environmental Restoration, Technical Writing; 3 years in Natural Area Reviews
Involvement:	Managed Areas

Allan J. Trently

Position:	Contract Zoologist
Education/Experience:	M.S., Biology, B.S., Environmental Resource Management; 13 years experience working with terrestrial animals
Involvement:	Wildlife, Threatened and Endangered Species

5.2. List of Agencies and Organizations Consulted

Federal Agencies

U.S. Fish and Wildlife Service

State Agencies

Tennessee Conservation League
Tennessee Department of Agriculture
Tennessee Department of Economic and Community Development
Tennessee Department of Environment and Conservation
Tennessee Department of Transportation
Tennessee Historical Commission
Tennessee Wildlife Resources Agency

Organization

Harpeth River Watershed Association

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APPENDIX I – CORRESPONDENCE

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HARPETH RIVER
WATERSHED ASSOCIATION

May 31, 2005

Mr. Tom Cureton
Tennessee Valley Authority
1101 Market Street, MR 4G
Chattanooga, TN 37402-2801

VIA EMAIL

RE: Proposed 161-kV Transmission Line Project, Nolensville, TN

Dear Mr. Cureton:

This letter provides comments from the Harpeth River Watershed Association (HRWA) on the proposed 161-kV Transmission Line project from Triune to Nolensville. HRWA is a science and technically based conservation non-profit organization. We receive state and federal grants, membership, corporate, and major donor support to protect the biological integrity of the Harpeth. With our River Restoration Program we have conducted field surveys and studies of erosion and sediment in the Harpeth, visual habitat assessments of streams around the watershed, dissolved oxygen studies, and begun a series of stream restoration projects. The various projects on the West Harpeth, Little Harpeth, in Eagleville, on the mainstem, and on the Turnbull involve a range of partners and financial support and usually involve key contributions from volunteers in their valuable time. Our other programs focus on integrating watershed and water quality goals into land use planning, stormwater regulations, working with developers on site design, and working with the state on various water conservation policy issues.

HRWA has been working with TVA and Middle Tennessee Electric Membership Corporation MTEMC since 2001 on a separate transmission line project proposed through the Franklin area across the main Harpeth and at one point down the West Harpeth. We also have worked with TVA and MTEMC staff on an energy efficiency pilot project in the Franklin area, and on watershed planning and development site planning options with TVA staff from the Economic Development section.

These comments will focus on two topics. The first will involve the siting of transmission and distribution lines in order to minimize the impact to river and stream corridors. In that section these comments will refer to the proposal alternatives for the Nolensville line in particular as best can be done without any field reconnaissance. The second topic will involve the larger planning issue of energy efficiency and its role in "infrastructure" expansion.

Transmission line routing and stream corridors and stream buffers:

As we have noted in comments to TVA and MTEMC in the past on the proposed TVA 161-kV transmission line from Aspen Grove to West Haven (originally to Bingham) in Franklin, one of the most important aspects of distribution and transmission lines that affects water quality is the need to manage the corridor to prevent tall vegetation that can damage the lines. Since these 100-foot right-of-way corridors require the removal of tall trees, it is important that these corridors cross rivers and streams as little as possible and do not run in and along and on-top of river and streams and/or their floodplains within 100 feet of the stream banks. The main concern HRWA raised with the proposed Aspen Grove to Bingham TVA line was that it was proposed to run along and on top of the West Harpeth for several miles and would require removal of much of the river's forested stream corridor. We are very supportive of the effort undertaken by TVA, MTEMC and many others to ultimately adjust and shorten this line so that the infrastructure so that the line is no longer running in the West Harpeth and the new substation location will be closer to Franklin where the increasing electrical demand is occurring.

As we noted in our comments in 2001 and 2003, HRWA has conducted a full-length main stem visual survey, a visual habitat survey of almost all of the TDEC designated "impaired"streams (segments on the 303(d) list) in the Harpeth, completed a sediment study and has a bank erosion study underway. A significant finding from our visual habitat assessment of over 200 sites was that over half had little or no "riparian" or streamside vegetation. This included such things as parking lot/commercial sites up to the streambank, agricultural landowners with unlimited livestock access to the stream, and residential developments with property up to the stream edge that was mowed. In addition, we found that all of the TVA or distribution line crossings surveyed were sites of several bank erosion and we supplied photos of our survey of some of these sites on the main stem and West Harpeth as examples.

While TVA and its distributors have vegetation management needs under the right-of-way to eliminate dangerously tall trees and other hazards to the line, much of the rest of the management under the line is left up to the landowner. From our surveys in the Harpeth, it appears that the TVA and distributor's right-of-way vegetation management, especially in the riparian zone shapes the land owner's management. Though TVA and its distributors from a line safety perspective want low growing vegetation, a lawn up to a stream or river bank will create unstable banks. These are the conditions seen under current river crossings in the Harpeth that are the areas of large bank erosion. One site on the main Harpeth is one of our bank erosion study sites. This 12 foot high vertical bank has only grass as riparian vegetation and is actively loosing huge chunks of bank each year along a 50 foot river length. We discussed just last week with TVA staff in Nashville, the opportunity during their vegetation management project under this 500-kVTVA transmission line right-of-way how to work with HRWA to begin some riparian restoration of this site and others.

Stable, non-eroding stream banks and a healthy riparian corridor along streams and rivers are critical the health of the aquatic life and to meet water quality standards. Large, actively eroding stream banks are a significant source of sediment in rivers as are construction sites with poor erosion control measures. Sediment is the primary pollutant affecting rivers in Tennessee according to TDEC. Silt in streams and rivers fill up the spaces in the in-stream cobble and pebble habitat and fill in the pools that are homes to the aquatic insects which are the main food source for fish. Turbid or "muddy" water in naturally clear systems also affect sensitive species of fish and mussels.

A stream buffer or riparian zone, which is the land along the stream that is the transition from aquatic to terrestrial habitats, provides important water quality and property protection services. A naturally vegetated stream buffer, protects property from erosion, can provide flood storage, will reduce flooding downstream because rain soaks into the ground in the buffer versus running off directly into the stream, prevents bank erosion in mast cases, and provides shade to the stream to maintain natural stream temperatures and prevent algal blooms that can cause low dissolved oxygen levels and fish kills. Stream buffers also effectively filter sediment and most pollutants and fertilizers from the land adjacent to the buffer and prevent these pollutants from reaching the stream. These stream buffer zones along streams, also are wildlife habitats and corridors.

According to a comprehensive review of the scientific literature in 1999 by Seth Wenger, in "A Review of the Scientific Literature on Riparian Buffer Width, Extent and Vegetation" (1999 University of Georgia Institute of Ecology Office of Public Service & Outreach), for stream buffers to provide these functions to maintain the aquatic health of the nearby stream, the stream buffers need to be 100 feet wide from either side of bank with an additional 2 feet for each 1% of slope. HRWA can provide a copy of this comprehensive review to any TVA staff or distributors who need it.

With this in mind and the need to actively keep vegetation under 30 feet tall under lines for safety reasons, TVA and its distributors need to incorporate a stream buffer requirement of this nature into its policy in siting transmission and distribution line infrastructure. Thus, it is not simply a matter of mitigating where possible the vegetation management under the right-of-way around streams, but to avoid crossing streams and rivers as much as possible and running lines beyond the 100-foot stream buffer. When river and stream crossings are necessary, they need to be perpendicular to reduce the amount of stream bank and buffer affected. Also, when needed to cross near or over an eroding streambank or poor riparian buffer, TVA and its distributors need to include restoration measures as part of its right-of-way management. TVA also needs to incorporate a standard streambank stabilization approach with larger stream crossings such as the one it is still working on with HRWA for the Harpeth mainstem crossings with the Aspen-Grove/West Haven 162-kV transmission line.

HRWA would like to work with TVA and its distributors on how to incorporate riparian buffer protection and stream bank erosion prevention into its policies for siting lines and work with HRWA in the Harpeth with

specific projects to restore these actively eroding stream banks and poor riparian habitat under existing right-of-ways. HRWA has been working on various aspects of stream buffer management as part of efforts in land use planning, state permits, and stormwater regulations. From review of the literature and efforts around the country, 100-foot stream buffers are working in a regulatory context and not considered an undo burden. In Williamson County, TVA and MTEMC will need to follow the new stream buffer requirements that went into effect in 2005 as part of the new county stormwater regulations. You can find these on the Williamson County web site under the engineering department. These are tiered from 50 feet on either side of bank for an intermittent or perennial stream draining less than 1 Square mile, to 75 feet for a drainage area of less than 5 square miles to 100 feet for a drainage area of over 5 square miles.

Issues Specific to the Alternatives proposed:

With respect to current water quality conditions in Arrington Creek, which is the creek system that this proposed Nolensville line will predominantly affect, TDEC in its 2004 draft Final 303(d) list, moved Arrington Creek off the list citing water quality data gathered at one site in 2002 that indicated that the creek meets water quality standards. The entire Arrington Creek system was on the original list for sediment from agricultural and development land uses. When HRWA conducted its visual stream habitat assessment, several sites in Arrington Creek were found with poor riparian habitat. One site on McCanless Branch was also a site of more detailed water quality testing by HRWA and as such this section has not removed from the 303d list. At this site, there is no riparian habitat in the section running through a farm.

With respect to the various alternatives for the Nolensville transmission line and the need to reduce stream crossings and avoid riparian corridors:

1) Route 3 as it meets route 1 needs to avoid going over or within 100 feet of the headwaters of the tributary to Mill Creek.
2) Alternative 1 along the tributary to Mill Creek to the proposed substation needs to be 100 feet away from the creek bank.
3) The southern prtion of Route 16 and Route 5 run parallel and/or along streams and this should be avoided or aligned so that the right-of-way is 100 feet away from stream banks.
4) Creek crossings need to be at a minimum. The route from 14, 12, 7, 5, 2, 1, appear to have the most stream crossings.
5) Route 4 crosses a farm with a conservation easement held by the Land Trust for TN that has as one of it's criteria to protect the scenic value of the property. A separate letter was sent to TVA from the Land Trust for TN.

As you know, TVA will be considering all the comments it receives, conducting some field visits and proposing a preferred alternative. This preferred alternative does NOT have to be one of these on the maps provided. HRWA is available to work with TVA, MTEMC, community leaders and others, on reviewing constraints and water quality issues and opportunities in the area. There is really no way without a through field visit for HRWA to state whether any of these alternatives is has the least impact on water quality and stream health without a thorough field reivew. A review of the topographic maps and other visuals at the public hearing can be helpful to identify some of the issues listed above.

Energy Efficiency and documents justifying the need for this electrical infrastructure:

As you know since we have worked with TVA and MTEMC in-depth on the proposed 161-kV transmission line from Aspen Grove to West Haven substation in Franklin, HRWA worked with many partners on two other issues: the decision-making process TVA and its distributors use to justify expanded electrical grid infrastructure and demand side management. Electrical demand is increasing with the growth in the southern 1-65 corridor around Franklin, Brentwood and in Nolensville. HRWA and others raised the fundamental planning point in 2001 that TVA and its distributors at that time were not adequately considering energy efficiency and demand side management in its electrical supply planning. A study was commissioned by Synapse Energy Economics in late 2001 to provide an independent analysis of the Franklin area (Aspen Grove-West Haven) proposed transmission line with regard to how TVA's decision-making procedures follow those required for other utilities that must meet FERC requirements to which TVA is exempt. Though both MTEMC and TVA provided material, the information provided did not justify the need for new transmission lines and did not demonstrate that energy efficiency alternatives had been considered (see Attachment 2).

Have there been updated assessments done by MTEMC and TVA since the 1999 One Owner Study prepared by MTEMC that was the basis of the TVA transmission line proposal in Franklin? As noted in our comments on the draft Environmental Assessment to the proposed Franklin TVA Transmission line in May 2003, several MTEMC distribution systems upgrades have been completed since that study. In addition, development patterns that reflect new electrical demand have changed since the 1999 study and give clarity to where the density will be. These all affect the planning for TVA transmission lines and MTEMC distribution lines. If there are new electrical planning documents, we would like to receive copies. There does not appear to be any justification documents for this proposed TVA transmission line, at least none referenced on the TVA web site or were at the public open house.

One of the points raised during the work with TVA and MTEMC on the Franklin proposed 161-kV transmission line that was proposed to run along and in the West Harpeth floodplain and riparian corridor, was that much of the electrical demand growth was concentrated around the western area of Franklin and not in much of the rural area of the "Bingham Service area." As a result of lots of effort by TVA, MTEMC, city of Franklin, HRWA, Heritage Foundation, and others, the proposed substation was relocated into Franklin in the West Haven subdivision so that the TVA line and infrastructure was brought in closer to the electrical demand and the rural areas were not shouldering the burden of growth.

With this Nolensville 161-kV proposed transmission line, it is important once again to look at where the electrical growth is that TVA/METMC need to serve and work with the local community leaders to provide that electrical infrastructure without putting the burden on rural and open areas that are not driving the infrastructure need. I was informed at the public open house that one driver for this proposed line was the growth in Nolensville. TVA/MTEMC needs to provide a written justification of the growth needs and the alternatives it is considering for this proposed Nolensville TVA transmission line. There were no alternatives other than various line routes shown at the open house. These alternatives, which will be addressed in the draft EA for this project, need to consider energy efficiency and demand side management as well.

On the issue of energy efficiency, the 2003 EA for the Franklin TVA transmission line described TVA's current energy efficiency programs which at the time were all voluntary as are those of MTEMC. As HRWA noted on the draft EA, TVA did not adequately consider the contribution that efficiency can make to addressing load growth, distribution power generation, and other options that could be put in place immediately and over time. The EA was based solely on electrical transmission, distribution, and system upgrades, not on any demand side management. Synapse Energy Economics references that the US Government Accounting Office completed a study of TVA's demand side management and found them lacking relative to other utilities (Attachment 1).

Synapse Energy Economics also conducted an analysis of the energy efficiency potential in Williamson County based on southeastern regional studies (Attachment 2). As you know, the best opportunity to maximize efficiency opportunities is during new construction. With the growth along the I-65 corridor and Nolensville, it is a great opportunity for MTEMC to address its system needs with energy efficiency. This had not been done at the time of this study in 2002. The analysis found that if only a portion of the cost-effective and technically available efficiency options were done that by 2010 electricity demand in the county could be reduced 13% which amounts to 274 GWh of electricity not needed. This compares to orders of magnitude smaller 84 MWh projected need for the Bingham service area in the EA. Also, this would result in net energy cost savings of $4.6 million a year! It will be interesting to see what the projected electricity needs are for the Nolensville area that this Nolensville TVA line is proposed to serve and compare it to the energy efficiency options.

Even though this study could not be very specific to Williamson County because of the lack of county specific data available to Synapse, the electrical needs in this region can be addressed with a combination of energy efficiency and infrastructure improvements that would reduce the cost to rate payers and enable the important cultural, environmental, historic, and aesthetic values of this region to be maintained. You will recall that TVA worked with Southface Energy Institute and MTEMC to begin a residential energy efficiency pilot project in Franklin with one or several developers. Could you inform us of the status of that effort? As you know, HRWA, and many organizations, including NES, who work in collaboration through the Cumberland River Compact's "Building Outside the Box" effort, are very interested in working with TVA and its distributors in the greater Nashville region on energy efficiency. It will take a coordinated effort amount many entities, to provide momentum on energy efficiency programs.

Summary of questions and suggestions:

1. Arrange a meeting with HRWA, TVA and MTEMC on policy for siting transmission lines that incorporate stream buffer width requirements and applying a streambank stabilization approach similar to the one worked on with HRWA for the Harpeth mainstem. Also consider a review of the current TVA guidelines on construction near streams, stream bank stabilization at line crossings, and vegetation management of line right-of-ways with to incorporate stream buffer and bank stabilization needs.

2. There appear to be some alternatives to the line proposed that may have more water quality issues than others, a good field survey is needed for any further analysis. Before proceeding, TVA and MTEMC need to make sure that the route 1 corridor from the proposed Nolensville substation is 100-feet or more away from the streambank of the Mill Creek tributary. Some alternatives have many more creek crossings than others as specified on page 4.

3. Provide assessments on the justifications for this proposed Nolensville transmission line and alternatives considering either by TVA or MTEMC. HRWA understands that such information will be in the draft Environmental Assessment, but working with local community leadership here can help verify if the assessments are accurate for the need for the line, and for opportunities to move on energy efficiency efforts. As you know, energy efficiency efforts will take coordinated effort with the local county and city governments and TVA and MTEMC to move forward, especially with options on upgrading building codes to increase new home and commercial energy efficiency and to expand participation in volunteer programs.

4. Provide the status and what is needed to get an energy efficiency building pilot launched in Williamson County that TVA was discussing with Southface in 2003-4?

Please do not hesitate to contact me with any questions and to work on any specific suggestions noted in this letter.

Sincerely,

Dorene Bolze

Dorene Bolze
Executive Director
(615) 591-9095

cc: Roger Sparry, TVA Power Supply
Hugh Barger, TVA Power Supply
Frank Jennings, President for MTEMC
Tom Suggs, Vice President of Engineering for MTEMC
Rogers Anderson, Williamson County Mayor
Joe Horne, Williamson County Community Development Director
Floyd Heflin, Williamson County Engineer
Regina Wilder, Williamson County Stormwater Coordinator
Lewis Green, County Commissioner for District 5
Newt McCord, County Commissioner for District 5
Jeanie Nelson, Executive Director, Land Trust for TN
Margo Fransworth and Gwen Griffith, Cumberland River Compact

List of Attachments:

1. Memo from Synapse Energy Economics, April 1, 2002, to HRWA and Southern Alliance for Clean Energy on "Initial Findings on Transmission Planning Issues".
2. Report prepared by Synapse Energy Economics, April 4, 2002, The Energy Efficiency Potential in Williamson County, TN: Opportunities for Reducing the Need for Transmission Expansion.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION
SUITE 1000, JAMES K. POLK BUILDING
NASHVILLE, TENNESSEE 37243-0344

December 13, 2005

Mr. Todd C. Liskey
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga, Tennessee 37402-2801

RE: T V A Transmission Line Project
Along SR 96 in the Arrington and Triune
Area, Williamson County

As requested, we have reviewed the map showing the location of the TVA transmission line as proposed.

The Department has current plans to upgrade State Route 96 between Franklin and Murfreesboro. The portion in review is currently in the preliminary engineering phase.

Mr. Gary King is the Project Manager for the entire length of SR 96 in Williamson County and will be able to provide additional information as to project status and location alternatives.

Should you have any questions, please call me at 615-741-2208.

Sincerely,

Steve Allen, Director
Project Planning Division

SA/DED/bgc

Attachments:
cc: Ed Cole
Glenda Tyus
Gary King
File

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
P. O. BOX 40747
NASHVILLE, TENNESSEE 37204

December 9, 2005

Todd C. Liskey
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga, TN 37402-2801

Dear Mr. Linskey:

We have reviewed the information that was provided by you concerning the proposed 161kV transmission line connection and proposed routes in Williamson County as requested. The Tennessee Wildlife Resources Agency does have concerns regarding this project. The Nashville crayfish (*Orconectes shoupi*), a Federally Endangered species, has been found and documented at several locations in the Mill Creek Watershed just downstream, less than a mile away, from the northern terminus of this project. Also, the State listed In-Need-of-Management species, the redband darter (Etheostoma luteovinctum) is found and documented from a location less than a mile from the northern terminus of this project.

We request that surveys be conducted for the Nashville crayfish in any of the tributaries of Mill Creek to be crossed to determine its presence at the crossing location, if construction requires the stream to be crossed with equipment. If the Nashville crayfish is found at any of these locations we request that the Tennessee Valley Authority consult with the U.S. Fish and Wildlife Service to determine methods of construction to avoid or reduce potential impacts to this species. We also request that if construction requires in-stream activities in any of the tributaries of Mill Creek to be crossed that surveys be conducted for the redband darter. If the redband darter is at any of these locations we request that the Tennessee Valley Authority consult with the Tennessee Wildlife Resources Agency to determine methods of construction to avoid or reduce potential impacts to this species.

Thank you for the opportunity to review and comment on this project.

Sincerely,

Robert M. Todd

Robert M. Todd
Fish and Wildlife Environmentalist

The State of Tennessee

AN EQUAL OPPORTUNITY EMPLOYER

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

December 2, 2005

Mr. Todd C. Liskey
Tennessee Valley Authority
Siting and Environmental Design Department
1101 Market Street
Chattanooga, TN 37402-2801

RE: Transmission Line Connection in Williamson County

Dear Mr. Liskey,

The Department of Environment and Conservation received information on the above-referenced project dated November 28, 2005 (received December 1, 2005). The Department will review this material and comment as appropriate.

If you have any questions, please contact our Environmental Policy Office at (615) 532-0929.

Sincerely,

Robin Cathcart

Robin Cathcart
Environmental Policy Office

cc: File 05-119

Todd C. Liskey
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga, Tennessee 37402-2801

Clovercroft 161-kV Substation - Provide Delivery Point

Dear Mr. Liskey:

This is in reference to Tennessee Valley Authority's project that was mailed to me on November 28, 2005.

The project as described by the project summary creates no incompatibility in our area of planning at this time.

Wilton Burnett, Jr.
Signature

DIR. OF SPECIAL PROJECTS
Title

TN ECD
Agency

312 8TH AVE. N, 11TH FLOOR
Address

NASHVILLE, TN 37243-0405

Tennessee Department of Agriculture
Ellington Agricultural Center, Box 40627, Nashville, Tennessee 37204
615-837-5100 / FAX: 615-837-5333

Ken Givens
Commissioner

Phil Bredesen
Governor

January 20, 2006

Mr. Todd C. Liskey
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
1101 Market Street, MR 4G-C
Chattanooga TN 37402-2801

Clovercroft 161-kV Substation – Provide Delivery Point

Dear Mr. Liskey:

This is in reference to Tennessee Valley Authority's project that was mailed to me on Novembr 28, 2005.

The project as described by the project summary creates no incompatibility in our area of planning at this time.

Signature

Deputy Commissioner

Tennessee Department of Agriculture
Agency

440 Hogan Road, Nashville TN 37220
Address

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

January 23, 2006

Mr. J. Bennett Graham
Tennessee Valley Authority
400 W. Summit Hill Drive
WT 11D - Cultural Resources
Knoxville, Tennessee 37902

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, CLOVERCROFT
161KV/SUBSTATION/ROADS, UNINCORPORATED, WILLIAMSON COUNTY, TN

Dear Mr. Graham:

At your request, our office has reviewed the above-referenced archaeological survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no archaeological resources eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

Herbert L. Harper

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jmb

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

August 8, 2006

Mr. Bo Baxter
Tennessee Valley Authority
400 West Summit Hill Drive
WT 11C-K
Knoxville, Tennessee 37901

Re: FWS #06-FA-1141

Dear Mr. Baxter:

Thank you for your email of August 2, 2006, concerning the proposed Nolensville 161-kV Transmission Line Project in Williamson County, Tennessee. Fish and Wildlife Service biologists have reviewed the information submitted and we offer the following comments.

We concur that the proposed project is not likely to adversely affect the federally endangered Nashville crayfish (*Orconectes shoupi*), provided that standard Best Management Practices are employed and that the following three additional conditions described in your correspondence are implemented:

1. A 100-foot Streamside Management Zone (Category B) as defined in TVA's Best Management Practices document will be established at the stream crossing.

2. No equipment will be allowed to enter the stream, and no temporary or permanent vehicle crossings will be constructed in the stream channel at the site of the transmission line crossing. If a stream crossing is needed, a temporary bridge will be employed. No instream disturbance will be allowed, and streambank disturbance will be limited to that needed to accomplish the crossing. All standard Best Management Practices to prevent runoff into the stream will be employed if a vehicle crossing is needed.

3. Streamside Management Zones will be established along three wet weather conveyances that cross the transmission line right-of-way to the north of the stream crossing.

In view of this, we believe that the requirements of section 7 of the Endangered Species Act have been fulfilled. Obligations under section 7 must be reconsidered, however, if: (1) new information reveals that the proposed project may affect listed species in a manner or to an extent not previously considered, (2) the proposed project is subsequently modified to include activities which were not considered during this review, or (3) new species are listed or critical habitat designated that might be affected by the proposed project.

Thank you for the opportunity to comment. Your concern for the protection of the Nashville crayfish is greatly appreciated. If you have any questions, please contact Jim Widlak of my staff at 931/528-6481, ext. 202.

Sincerely,

Lee A. Barclay, Ph.D.
Field Supervisor

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APPENDIX II – TENNESSEE VALLEY AUTHORITY/POWER DISTRIBUTORS ENERGY-EFFICIENCY INITIATIVES

I Introduction

Tennessee Valley Authority (TVA) has a strong track record in promoting and demonstrating the wise use of energy. TVA and power distributors have aggressively pursued such programs as part of our role as leaders in public power, and we are continuing to explore opportunities to expand energy conservation.

Among the most successful ways in which TVA leads the industry in the wise use of electricity is the *energy right*® Residential Program that was launched in 1996. By the end of FY05, TVA achieved approximately 385 MW of peak load reduction Valley-wide through implementation of the *energy right* initiatives. These initiatives promote high-efficiency heating, ventilating, and air conditioning (HVAC) systems, better thermal envelopes, and other measures that save energy and reduce peak demand for Valley residents. The impacts from these programs are expected to grow steadily with continued annual participation.

In addition, the Direct Load Control (DLC) program provides approximately 30 MW of peak load reduction yearly through the cycling of residential water heaters and air conditioners by radio signal across the Valley. This program offers homeowners incentives in return for allowing their appliances to be switched off remotely for short periods during peak loads. TVA currently has 13 distributors participating in DLC. Such programs offer significant potential for energy management.

TVA's Customer Service and Marketing Groups have many active programs in addition to the residential programs described above. Efforts include energy audits and large commercial and industrial marketing initiatives such as lighting improvements, power quality improvements, and industrial process energy efficiency. These programs contribute to the overall energy efficiency of commercial and industrial facilities in the Valley.

II Program Descriptions

The following sections provide brief explanations of the programs that contribute to TVA's energy-efficiency initiatives.

II.I energy *right*® Programs

- **Residential Heat Pump Retrofit Program -** designed to promote the installation of high-efficiency heat pumps in homes and small businesses. Installation, performance, and weatherization standards have been established to ensure the comfort of the customer and the proper operation of the system. A Quality Contractor Network has been established for maintaining high standards for installation. Through a third-party lender, TVA provides 10-year financing for residential heat pumps with repayment through the consumer's electric bill. Distributors receive a cash incentive for each heat pump installed in the program.

- **Residential New Homes Program -** promotes higher-efficiency thermal envelope standards and quality construction in new homes and the installation of energy-efficient heat pumps. The program provides training for home builders and trade allies to ensure

proper installation of energy-efficiency measures. Distributors receive a cash incentive for each home built in the program.

- **Residential Manufactured Homes Program -** focuses on achieving improvements in the HVAC and thermal envelope components of manufactured housing. Program requires that the home be equipped with an energy-efficient heat pump. Cash incentives are provided.

- **Student Audit -** package presented to students to fill out and conduct home audit. Students return the audit through the school for analysis and recommendations are made for energy-efficiency implementation measures.

Additional information on *energy right* Programs can be found on the Web at www.energyright.com. The following table provides residential demand reduction information for the MTEMC service area over the previous five fiscal years (FY).

FY01-FY05 History of *energy right* Installations, MTEMC service area

	Units Installed	**Kilowatt Demand Reduction**
New Manufactured Homes	346	1059
Heat Pump Installations	1199	1295
Single Family New Homes	3733	6981
Multi-Family New Homes	260	247
Totals	**5538**	**9582**
energy right Total		9.6MW Reduction
Direct Load Control, 2006 program audit		6.7MW Reduction
Total, Current Residential Programs Five-Year Impact		**16.3 MW Reduction**

MW = megawatt

II.II Energy Services

Another TVA/Power Distributor program offers energy services to schools, local government, businesses, and industries. These services lower the customer's energy use, making the businesses more competitive and helping TVA reduce peak loads on its power system. This energy-services initiative provides technical expertise, project management support, and third-party financing to assist commercial and industrial customers with energy-efficiency upgrades and operational improvements.

II.III Large Commercial and Industrial Services

The Large Commercial Program works to improve the efficiency and reduce the owning and operating costs of schools, restaurants, and other large commercial facilities. The Industrial Services Program develops energy solutions to industrial, environmental, productivity, and product process quality problems for Valley industries.

TVA has targeted HVAC systems in educational and other fast-growing segments such as nursing homes, assisted living, and government facilities. This effort has resulted in the installation of over 250 geothermal systems throughout the Valley. TVA also has targeted food services in schools, restaurants, and convenience stores. Industrial Marketing Staff focus on the estimated 28,000 manufacturers in the Tennessee Valley. Specialists target the chemical, food processing, furniture, municipal water/wastewater, machinery, transportation, metals, pulp/paper, printing, textiles, and electronics market segments. TVA offers these manufacturers process improvements, product quality improvements, solutions to environmental problems, and operating cost reductions.

II.IV Energy Audits

TVA provides energy audits through a distributor partnership program. This partnership initiative brings TVA engineering and technical resources to commercial and industrial customers. The program surveys energy use patterns and recommends energy-efficiency improvements in numerous areas. Information is not available on actual implementation of these recommendations.

II.V Other Initiatives

TVA and power distributors also offer a variety of pricing options that give large energy users incentives to manage their electricity use. Through a combination of programs, we have successfully reduced energy consumption for hundreds of businesses and schools throughout the region.

In FY02 Pacific Energy Associates (PEA) was contracted by TVA to assess a number of demand-side management options that could achieve up to 250 MW of peak demand reduction in a two-year period. The assumptions and findings of this study were applied to the MTEMC service area in order to determine load reduction potential in the Nolensville/Clovercroft area. The following table includes the findings of the original study, as well as a percentage applied to the MTEMC service area based on the original assumptions of the study.

	Assumptions, PEA Study, TVA system-wide[1]	Actual, MTEMC service area[2]	Percent TVA Total in MTEMC area
Residential Customers	3,547,242	141,980	4.0
C&I <50 kW	558,749	17,914	3.2
C&I >50 kW	62,796	2,430	3.9
C&I > 5,000 kW	476	3	.63
	Findings, PEA Study, TVA system-wide[3]	Findings Applied to MTEMC area [4]	
Average MW	92	3.7	
Peak MW	187	7.6	

< = Less than
> = Greater than
C&I = Commercial and Industrial
kW = Kilowatt
MW = Megawatt

[1] Source: Total Valley distribution, June 2002; may be slightly higher than numbers reported to PEA
[2] Source: 2006 Tennessee Valley Public Power Association Membership Directory; data compiled in October 2005 distributor survey
[3] Data from actual Pacific Energy Associates Report FY02
[4] Applied using percentage of actual customers as of October 2005

APPENDIX III – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY CLEARING SPECIFICATIONS

1. General - The clearing contractor shall review the environmental evaluation documents (Categorical Exclusion Checklist, Environmental Assessment, or Environmental Impact Statement) for the project or proposed activity, along with all clearing and construction appendices, conditions in applicable general and/or site-specific permits, the storm water pollution prevention plan, and any Tennessee Valley Authority (TVA) commitments to property owners. The contractor shall then plan and carry out operations using techniques consistent with good engineering and management practices as outlined in TVA's Best Management Practice (BMP) manual (Muncy 1992, and revisions thereto). The contractor will protect areas that are to be left unaffected by access or clearing work at and adjacent to all work sites. In sensitive areas and their buffers, the contractor will retain as much native ground cover and other vegetation as possible.

   If the contractor fails to use BMPs or to follow environmental expectations discussed in the prebid or prework meeting or present in contract specifications, TVA will order corrective changes and additional work as deemed necessary in TVA's judgment to meet the intent of environmental laws and regulations or other guidelines. Major violations or continued minor violations will result in work suspension until correction of the situation is achieved or other remedial action is taken at the contractor's expense. Penalty clauses may be invoked as appropriate.

2. Regulations - The clearing contractor shall comply with all applicable Federal, state, and local environmental and antipollution laws, regulations, and ordinances including without limitation all air, water, solid and hazardous waste, noise, and nuisance laws, regulations, and ordinances. The contractor shall secure or ensure that TVA has secured all necessary permits or authorizations to conduct work on the acres shown on the drawings and plan and profile for the contract. The contractor's designated project manager will actively seek to prevent, control, monitor, and safely abate all commonly recognized forms of workplace and environmental pollution. Permits or authorizations and any necessary certifications of trained or licensed employees shall be documented with copies submitted to TVA's right-of-way inspector or construction environmental engineer before work begins. The contractor will be responsible for meeting all conditions specified in permits. Permit conditions shall be reviewed in prework discussions.

3. Land and Landscape Preservation - The clearing contractor shall exercise care to preserve the condition of cleared soils by avoiding as much compacting and deep scarring as possible. As soon as possible after initial disturbance of the soil and in accordance with any permit(s) or other state or local environmental regulatory requirements, cover material shall be placed to prevent erosion and sedimentation of water bodies or conveyances to surface water or groundwater. In areas outside the clearing, use, and access areas, the natural vegetation shall be protected from damage. The contractor and his employees must not deviate from delineated access routes or use areas, and must enter the site at designated areas that will be marked. Clearing operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the remaining natural vegetation and adjacent surroundings in the vicinity of the work. In sensitive public or environmental areas, appropriate buffer zones shall be observed and the methods of clearing or reclearing modified to protect the buffer and sensitive area. Some areas may require planting native

plants or grasses to meet the criteria of regulatory agencies or commitments to special program interests.

4. Streamside Management Zones - The clearing contractor must leave as many rooted ground cover plants as possible in buffer zones along streams and other bodies of water or wet-weather conveyances thereto. In such streamside management zones (SMZ), tall-growing tree species (trees that would interfere with TVA's National Electric Safety Code clearances) shall be cut, and the stumps may be treated to prevent resprouting. Low-growing trees identified by TVA as marginal electrical clearance problems may be cut, and then stump treated with growth regulators to allow low, slow-growing canopy development and active root growth. Only approved herbicides shall be used, and herbicide application shall be conducted by certified applicators from the TVA's Transmission, Operations, and Maintenance organization after initial clearing and construction. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment, such as a feller-buncher. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Disturbed soils in SMZs must be stabilized by appropriate methods immediately after the right-of-way is cleared. Stabilization must occur within the time frame specified in applicable storm water permits or regulations. Stumps within SMZs may be cut close to the ground but must not be removed or uprooted. Trees, limbs, and debris shall be immediately removed from streams, ditches, and wet areas using methods that will minimize dragging or scarring the banks or stream bottom. No debris will be left in the water or watercourse. Equipment will cross streams, ditches, or wet areas only at locations designated by TVA after the application of appropriate erosion control BMPs consistent with permit conditions or regulatory requirements.

5. Wetlands - In forested wetlands, tall trees will be cut near the ground, leaving stumps and roots in place. The cambium may be treated with herbicides applied by certified applicators from the TOM organization to prevent regrowth. Understory trees that must be initially cut and removed may be allowed to grow back or may be treated with tree growth regulators selectively to slow growth and increase the reclearing cycle. The decision will be situationally made based on existing ground cover, wetland type, and tree species since tall tree removal may "release" understory species and allow them to grow quickly to "electrical clearance problem" heights. In many circumstances, herbicides labeled for water and wetland use may be used in reclearing.

6. Sensitive Area Preservation - If prehistoric or historic artifacts or features that might be of archaeological significance are discovered during clearing or reclearing operations, the activity shall immediately cease within a 100-foot radius, and a TVA right-of-way inspector or construction environmental engineer and the Cultural Resources Program manager shall be notified. The site shall be protected and left as found until a determination about the resources, their significance, and site treatment is made by TVA's Cultural Resources Program. Work may continue beyond the finding zone and the 100-foot radius beyond its perimeter.

7. Water Quality Control - The contractor's clearing and disposal activities shall be performed using BMPs that will prevent erosion and entrance of spillage, contaminants, debris, and other pollutants or objectionable materials into drainageways, surface water, or groundwater. Special care shall be exercised in refueling equipment to prevent spills. Fueling areas shall be remote from any sinkhole, crevice, stream, or other water body.

Open burning debris will be kept away from streams and ditches and shall be incorporated into the soil.

The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

8. Turbidity and Blocking of Streams - If temporary clearing activities must interrupt natural drainage, appropriate drainage facilities and erosion/sediment controls shall be provided to avoid erosion and siltation of streams and other water bodies or water conveyances. Turbidity levels in receiving waters or at storm water discharge points shall be monitored, documented, and reported if required by the applicable permit. Erosion and sediment control measures such as silt fences, water bars, and sediment traps shall be installed as soon as practicable after initial access, site or right-of-way disturbance in accordance with applicable permit or regulatory requirements.

   Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct necessary stream crossings under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Any clearing debris that enters streams or other water bodies shall be removed as soon as possible. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained for stream crossings.

9. Air Quality Control - The clearing or reclearing contractor shall take appropriate actions to limit the amount of air emissions created by clearing and disposal operations to well within the limits of clearing or burning permits and/or forestry or local fire department requirements. All operations must be conducted in a manner that prevents nuisance conditions or damage to adjacent land crops, dwellings, highways, or people.

10. Dust and Mud Control - Clearing activities shall be conducted in a manner that minimizes the creation of fugitive dust. This may require limitations as to type of equipment, allowable speeds, and routes utilized. Control measures such as water, gravel, etc., or similar measures may be used subject to TVA approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

11. Burning - The contractor shall obtain applicable permits and approvals to conduct controlled burning. The contractor will comply with all provisions of the permit, notification, or authorization including burning site locations, controlled draft, burning hours, and such other conditions as stipulated. If weather conditions such as wind speed or wind direction change rapidly, the contractor's burning operation may be temporarily stopped by TVA's field engineer. The debris to be burned shall be kept as clean and dry as possible and stacked and burned in a manner that produces the minimum amount of smoke. Residue

from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

12. Smoke and Odors - The contractor will properly store and handle combustible and volatile materials that could create objectionable smoke, odor, or fumes. The contractor shall not burn oil or refuse that includes trash, rags, tires, plastics, or other manufactured debris.

13. Vehicle Exhaust Emissions - The contractor shall maintain and operate equipment in a manner that limits vehicle exhaust emissions. Equipment and vehicles will be kept within the manufacturers' recommended limits and tolerances. Excessive exhaust gases will be eliminated, and inefficient operating procedures will be revised or halted until corrective repairs or adjustments are made.

14. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way, except in designated sensitive areas. The clearing or reclearing contractor will properly maintain these vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

15. Noise Control - The contractor shall take steps to avoid the creation of excessive sound levels for employees, the public, or the site and adjacent property owners. Concentration of individual noisy pieces as well as the hours and locations of operation should be considered.

16. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers. The equipment and mufflers shall be maintained at peak operating efficiency.

17. Sanitation - A designated representative of TVA or the clearing contractor shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable Federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

18. Refuse Disposal - The clearing or reclearing contractor shall be responsible for daily cleanup and proper labeling, storage, and disposal of all refuse and debris on the site produced by his operations and employees. Facilities that meet applicable regulations and guidelines for refuse collection will be required. Only approved transport, storage, and disposal areas shall be used.

19. Brush and Timber Disposal (Reclearing) - The reclearing contractor shall place felled tree boles in neat stacks at the edge of the right-of-way, with crossing breaks at least every 100 feet. Property owner requests shall be reviewed with the project manager or right-of-way specialist before accepting them. Lop and drop activities must be specified in the contract

and on plan and profile drawings with verification with the right-of-way specialist before conducting such work. When tree trimming and chipping is necessary, disposal of the chips on the easement or other locations on the property must be with the consent of the property owner and the approval of the right-of-way specialist. No trees, branches, or chips shall remain in a surface water body or be placed at a location where washing into a surface water or groundwater source might occur.

20. Brush and Timber Disposal (Initial Clearing) - For initial clearing, trees are commonly part of the contractor's contract to remove as they wish. Trees may be removed from the site for lumber or pulpwood or they may be chipped or stacked and burned. All such activities must be coordinated with the TVA field engineer, and the open burning permits, notifications, and regulatory requirements must be met. Trees may be cut and left in place only in areas specified by TVA and approved by appropriate regulatory agencies. These areas may include sensitive wetlands or SMZs where tree removal would cause excessive ground disturbance or in very rugged terrain where windrowed trees are used as sediment barriers along the edge of the right-of-way.

21. Restoration of Site - All disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    B. If needed, appropriate soil amendments will be added.

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide for Environmental Protection and Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.* Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

    D. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

Revision July 2003

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APPENDIX IV – TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor shall plan, coordinate, and conduct operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting. This specification contains provisions that shall be considered in all TVA and contract construction operations. If the contractor fails to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all structure and conductor pulling sites, protective measures to prevent erosion will be taken immediately upon the end of each step in a construction sequence, and those protective measures will be inspected and maintained throughout the construction and right-of-way rehabilitation period.

2. Regulations - TVA and/or the assigned contractor shall comply with all applicable Federal, state, and local environmental and antipollution laws, regulations, and ordinances related to environmental protection and prevention, control, and abatement of all forms of pollution.

3. Use Areas - TVA and/or the assigned contractor's use areas include but are not limited to site office, shop, maintenance, parking, storage, staging, assembly areas, utility services, and access roads to the use areas. The construction contractor shall submit plans and drawings for their location and development to the TVA engineer and project manager for approval. Secondary containment will be provided for fuel and petroleum product storage pursuant to 29CFR1910.106(D)(6)(iii)(OSHA).

4. Equipment - All major equipment and proposed methods of operation shall be subject to the approval of TVA. The use or operation of heavy equipment in areas outside the right-of-way, access routes, or structure, pole, or tower sites will not be permitted without permission of the TVA inspector or field engineer. Heavy equipment use on steep slopes (greater than 20 percent) and in wet areas will be held to the minimum necessary to construct the transmission line. Steps will be taken to limit ground disturbance caused by heavy equipment usage, and erosion and sediment controls will be instituted on disturbed areas in accordance with state requirements.

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual structure, pole, or tower sites, where only footing locations and controlled runoff diversions shall be created that disturb the soil. All other areas of ground cover or in-place stumps and roots shall remain in place. (Note: Tracked vehicles disturb surface layer of the ground due to size and function.) Some disking of the right-of-way may occur for proper seedbed preparation.

   Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the structure sites except around foundation holes; the water must be directed away from the site in as dispersed a manner as possible. At tower or structure sites, some means of upslope interruption of potential overland flow and diversion around

the footings should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any structure.

5. Sanitation - A designated TVA or contractor representative shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable Federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

6. Refuse Disposal - Designated TVA and/or contractor personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his operations and by his employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition, and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Contractors must meet similar provisions on any project contracted by TVA.

7. Landscape Preservation - TVA and its contractors shall exercise care to preserve the natural landscape in the entire construction area as well as use areas, in or outside the right-of-way, and on or adjacent to access roads. Construction operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural vegetation and surroundings in the vicinity of the work.

8. Sensitive Areas Preservation - Certain areas on site and along the right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, water supply watersheds, and public recreational areas such as parks and monuments. Contractors and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing or construction operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's right-of-way inspector or construction superintendent and Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere beyond the 100-foot perimeter.

9. Water Quality Control - TVA and contractor construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain Best Management Practices (BMPs) such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the right-of-way, on a construction site, or on access roads.

10. Turbidity and Blocking of Streams - Construction activities in or near SMZs or other bodies of water shall be controlled to prevent the water turbidity from exceeding state or local water quality standards for that stream. All conditions of a general storm water permit, aquatic resource alteration permit, or a site-specific permit shall be met including monitoring of turbidity in receiving streams and/or storm water discharges and implementation of appropriate erosion and sediment control measures.

    Appropriate drainage facilities for temporary construction activities interrupting natural site drainage shall be provided to avoid erosion. Watercourses shall not be blocked or diverted unless required by the specifications or the TVA engineer. Diversions shall be made in accordance with TVA's *A Guide for Environmental Protection and Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities.*

    Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct crossings or to perform required construction under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained.

    Wastewater from construction or dewatering operations shall be controlled to prevent excessive erosion or turbidity in a stream, wetland, lake, or pond. Any work or placing of equipment within a flowing or dry watercourse requires the prior approval of TVA.

11. Clearing - No construction activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure sites and conductor setup areas. TVA and the construction contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed that have previously been restabilized after clearing operations. Control measures shall be implemented as soon as practicable after disturbance in accordance with applicable Federal, state, and/or local storm water regulations.

12. Restoration of Site - All construction disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

B. If needed, appropriate soil amendments will be added.

C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide for Environmental Protection and Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities*. Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

D. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

13. Air Quality Control - Construction crews shall take appropriate actions to minimize the amount of air pollution created by their construction operations. All operations must be conducted in a manner that avoids creating a nuisance and prevents damage to lands, crops, dwellings, or persons.

14. Burning - Before conducting any open burning operations, the contractor shall obtain permits or provide notifications as required to state forestry offices and/or local fire departments. Burning operations must comply with the requirements of state and local air pollution control and fire authorities and will only be allowed in approved locations and during appropriate hours and weather conditions. If weather conditions such as wind direction or speed change rapidly, the contractor's burning operations may be temporarily stopped by the TVA field engineer. The debris for burning shall be piled and shall be kept as clean and as dry as possible, then burned in such a manner as to reduce smoke. No materials other than dry wood shall be open burned. The ash and debris shall be buried away from streams or other water sources and shall be in areas coordinated with the property owner.

15. Dust and Mud Control - Construction activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

16. Vehicle Exhaust Emissions - TVA and/or the contractors shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.

17. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary

maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way except in designated sensitive areas. The Heavy Equipment Department within TVA or the construction contractor will properly maintain these vehicles with approved spill prevention controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

18. Smoke and Odors - TVA and/or the contractors shall properly store and handle combustible material that could create objectionable smoke, odors, or fumes. The contractor shall not burn refuse such as trash, rags, tires, plastics, or other debris.

19. Noise Control - TVA and/or the contractor shall take measures to avoid the creation of noise levels that are considered nuisances, safety, or health hazards. Critical areas including but not limited to residential areas, parks, public use areas, and some ranching operations will require special considerations. TVA's criteria for determining corrective measures shall be determined by comparing the noise level of the construction operation to the background noise levels. In addition, especially noisy equipment such as helicopters, pile drivers, air hammers, chippers, chain saws, or areas for machine shops, staging, assembly, or blasting may require corrective actions when required by TVA.

20. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers as required by the Department of Labor's "Safety and Health Regulations for Construction." TVA may require spark arresters in addition to mufflers on some engines. Air compressors and other noisy equipment may require sound-reducing enclosures in some circumstances.

21. Damages - The movement of construction crews and equipment shall be conducted in a manner that causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor will be responsible for erosion damage caused by his actions and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the contract dealing with damages will apply.

Revision July 2003

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APPENDIX V – TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS

Even the most carefully designed transmission line project eventually will affect one or more creeks, rivers, or other type of water body. These streams and other water areas are protected by state and Federal law, generally support some amount of fishing and recreation, and, occasionally, are homes for important and/or endangered species. These habitats occur in the stream and on strips of land along both sides (the streamside management zone [SMZ]) where disturbance of the water, land, or vegetation could have an adverse effect on the water or stream life. The following guidelines have been prepared to help Tennessee Valley Authority (TVA) Transmission Construction staff and their contractors avoid impacts to streams and stream life as they work in and near SMZs. These guidelines expand on information presented in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities.*

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Resource Stewardship staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, or C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream as well as state and Federal requirements to avoid harming certain species. The category designation for each site will be marked on the plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

(A) Standard Stream Protection

This is the standard (basic) level of protection for streams and the habitats around them. The purpose of the following guidelines is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Guidelines:

1. All construction work around streams will be done using pertinent Best Management Practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, “Standards and Specifications.”

2. All equipment crossings of streams must comply with appropriate state permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance

and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for Federal endangered species. The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

Guidelines:

1. Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities*, especially Chapter 6, “Standards and Specifications.”

2. All equipment crossings of streams must comply with appropriate state (and, at times, Federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Proposed crossings of permanent streams must be discussed in advance with Resource Stewardship staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those required to meet National Electric Safety Code and danger tree requirements. Stumps can be cut close to ground level but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

(C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

Guidelines:

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities*, especially Chapter 6, "Standards and Specifications."

2. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Resource Stewardship staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat. All crossings of streams also must comply with appropriate state (and, at times, Federal) permitting requirements.

3. Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Resource Stewardship staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 0.30 meter (1 foot) above the ground line.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Resource Stewardship staff.

Additional Help

If you have questions about the purpose or application of these guidelines, please contact your supervisor or the environmental coordinator in the local Transmission Service Center.

Revision July 2003

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 1)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	• All TVA construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "BMP Standards and Specifications."	Except as modified by guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities*, especially Chapter 6, "BMP Standards and Specifications."	• Except as modified by guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities,* especially Chapter 6, "BMP Standards and Specifications."
2. Equipment Crossings	• All crossings of streams must comply with appropriate state and Federal permitting requirements. • Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.	• All crossings of streams must comply with appropriate state and Federal permitting requirements. • Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. • Proposed crossings of permanent streams must be discussed in advance with Resource Stewardship staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	• All crossings of streams also must comply with appropriate state and Federal permitting requirements. • All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Resource Stewardship staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

Comparison of Guidelines Under the Three Stream and Water Body Protection Categories (page 2)

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. Cutting Trees	• Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees with SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance an impacts to the SMZ and surrounding area. • Cutting of trees near permanent streams must be limited to those meeting National Electric Safety Code and danger tree requirements. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Resource Stewardship staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. • Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.
4. Other Vegetation	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as feasible.	• Other vegetation near streams must be disturbed as little as possible during construction. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.	• Other vegetation near the unique habitat must be disturbed as little as possible during construction. • The soil must not be disturbed by plowing, disking, blading, or grading. • Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Resource Stewardship staff

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APPENDIX VI – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY VEGETATION MANAGEMENT

Overview

TVA must manage the vegetation on its rights-of-way (ROW) and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must maintain adequate clearance, as specified by the National Electrical Safety Code, between conductors and tall growing vegetation and other objects. This requirement applies to vegetation within the ROW as well as to trees located off the ROW.

Each year TVA assesses the conditions of the vegetation on and along its ROWs. This is accomplished by aerial inspections, periodic field inspections, aerial photography, and information from TVA personnel, property owners and the general public. Important information gathered during these assessments includes the coverage by various vegetation types, the mix of plant species, the observed growth, the seasonal growing conditions and the density of the tall vegetation. TVA also evaluates the proximity, height, and growth rate of trees adjacent to the ROW that may be a danger to the line or structures. TVA ROW Specialists develop a vegetation re-clearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

ROW Management Options

TVA uses an integrated vegetation management approach. In farming areas, TVA encourages property owner management of the ROW using low growing crops. In dissected terrain with rolling hills and interspersed woodlands, TVA uses mechanical mowing to a large extent.

When slopes become hazardous to farm tractors and rotary mowers, TVA may use a variety of herbicides specific to the species present with a variety of possible application techniques. When scattered small stands of tall growing vegetation are present and access along the ROW is difficult, or the path to such stands is very long, herbicides may be used.

In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Health and Safety Administration. For that reason, TVA is actively looking at better control methods including use of low volume herbicide applications, occasional single tree injections, and tree growth regulators.

TVA does not encourage tree re-clearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work. Private property owners may re-clear the ROW with trained re-clearing professionals.

Mechanical mowers not only cut the tall saplings and seedlings on the ROW, they also shatter the stump and the supporting near surface root crown. The tendency of resistant species is to re-sprout from the root crown and shattered stumps can produce a multi-stem dense stand in the immediate area. Repeated use of mowers on short cycle re-clearing with many original stumps re-growing in the above manner can create a single species

thicket or monoculture. With the original large root system and multiple stems, the resistant species can produce re-growth at the rate of 5-10 feet in a year. In years with high rainfall the growth can reach 12-15 feet in a single year. These created dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner concern. Selective herbicide application may be used to control monoculture stands.

TVA encourages property owners to sign an agreement to manage ROWs on their land for wildlife under the auspices of "Project Habitat," a joint project by TVA, BASF, and wildlife organizations, e.g., National Wild Turkey Federation, Quail Unlimited, and Buckmasters. The property owner maintains the ROW in wildlife food and cover with emphasis on quail, turkey, deer or other wildlife. A variation used in or adjacent to developing suburban areas is to sign agreements with the developer and residents to plant and maintain wildflowers on the ROW.

TVA places strong emphasis on managing ROWs in the above manner. When the property owners do not agree to these opportunities, TVA must maintain the ROW in the most environmentally acceptable, cost-effective, and efficient manner possible.

Herbicide Program

TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife, and U.S. Forest Service personnel to explore options for vegetation control. The results have been strong recommendations to use species specific, low volume, herbicide applications in more situations. Research, demonstrations, and other ROW programs show a definite improvement of ROWs treated with selective low volume applications of new herbicides using a variety of application techniques and timing.

Low volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection and more wildlife food plants and cover plants develop. In most situations there is increased development of wild flowering plants and shrubs. In conjunction with herbicides, the diversity and density of low growing plants provide control of tall growing species through competition.

Wildlife managers often request the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains ground cover year around with a better mix of food species and associated high protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber tired equipment).

Property owners interested in tree production often request the use of low volume applications rather than hand or mechanical clearing because of the insect and fungus problems in damaged vegetation and debris left on ROW. The insect and fungus invasions, such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

Best Management Practices (BMPs) governing application of herbicides are contained within "*A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities",* which

is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. “Applicators” must be trained, licensed, and follow manufacturers’ label instructions, Environmental Protection Agency (EPA) guidelines, and respective state regulations and laws.

When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated “Restricted Use” by EPA require application by or under the supervision of applicators certified by the respective state control board. Aerial and ground applications are done either by TVA or by contractors in accordance with the following guidelines identified in the TVA B MP manual:

1. The sites to be treated are selected and application directed by the appropriate TVA official.
2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.
3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed five miles per hour, in areas of fog, or during periods of temperature inversion.
4. Pellet application will normally not be made when the surface wind speeds exceed ten miles per hour, or on frozen or water saturated soils.
5. Liquid application is not performed when the temperature reaches 95 degrees (F) or above.
6. Application during unstable, unpredictable, or changing weather patterns is avoided.
7. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.
8. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZs) (200 feet minimum width) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.
9. Buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.
10. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits (b) off the right-of-way and (c) during rainy periods or during the 48- hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.
11.

Herbicides Currently Used on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Escort	Metsulfuron Methyl/ dry flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Transline	Clopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Krenite S	Fosamine Ammoinium	Caution
Spike 20P	Tebuthiuron	Caution

Herbicides Currently Used for Bare Ground Areas on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Chopper	Imazapyr/RTU	Caution
Topsite	Diuron/Imazapyr	Caution
Roundup	Glyphosate/Liquid	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Sahara	Diuron/Imazapyr	Caution
Roundup Pro	Glyphosate	Caution

Tree growth regulators (TGRS) may be used on tall trees that have special circumstances where they must be trimmed on a regular cycle.

TGRs Currently Used on TVA Rights-of-Way

TGR	Flurprimidol	Caution
Profile 2SC	TGR-paclobutrazol	Caution

TVA currently utilizes Activate Plus, manufactured by Terra, as an adjuvant to herbicides to improve the performance of the spray mixture. Application rates are consistent with the EPA-approved label. U. S. Fish and Wildlife has expressed some concern on toxicity effects of surfactants on aquatic species. TVA is working in coordination with Mississippi State University and chemical companies to evaluate efficacy of additional low-toxicity surfactants, including LI700 as manufactured by Loveland Industries, through side-by-side test plots in the streamside management zones of area transmission lines.

The herbicides and TGRs listed above have been evaluated in extensive studies in support of registration applications and label requirements. Many have been reviewed in the U.S. Forest Service Vegetation Management Environmental Impact Statements and those evaluations are incorporated here by reference. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low environmental toxicity when applied by trained applicators following the label and registration procedures, including prescribed measures, such as buffer zones, to protect threatened and endangered species.

The rates of application utilized are those listed on the EPA approved label and consistent with utility standard practice throughout the Southeast. TVA currently uses primarily low volume applications of foliar and basal applications of Accord (Glyphosate) and Accord (Glyphosate)-Arsenal (Imazapyr) tank mixes. Glyphosate is one of the most widely used herbicidal active ingredients in the world, and has been continuously the subject of numerous exhaustive studies and scrutiny to determine its potential impacts on humans, animals and the environment.

Accord - Accord is labeled for vegetation management in forestry and utility ROW applications. It has a full aquatics label, and can be applied to emergent weeds in all bodies of fresh and brackish water. There is limited restriction on the use of treated water for irrigation, recreation or domestic purposes. Accord is applied to the foliage of actively growing plants. The active ingredient is absorbed through the leaves and rapidly moves throughout the plant. Glyphosate prevents the plant from producing amino acids that are unique to plants and which are building blocks of plant proteins. The plant, unable to make proteins, stops growing and dies.

The favorable environmental fate characteristic of Accord herbicide and its major metabolite (breakdown product) aminomethylphosphonic acid (AMPA) is well known. Continuing research is underway with more than 400 studies conducted to date in the laboratory and under field use conditions. These studies show rapid breakdown, little soil or plant debris retention and little vertical movement into soil below the surface.

Glyphosate is naturally degraded by microbes in soil and water under both aerobic (with oxygen) and anaerobic (without oxygen) conditions. AMPA is further degraded in soil and sediments to: phosphorus, nitrogen, hydrogen and carbon dioxide. Glyphosate binds rapidly and completely to a wide range of soils and sediment when introduced into the environment. This essentially eliminates movement in the soil. The average half-life of glyphosate in soils is less than 45 days. Half-life for the dissipation of glyphosate in environmental waters ranges from 1.5 to 14 days.

Glyphosate is non-toxic to birds, mammals and bees and has been shown not to bioaccumulate since it acts in plants through an enzyme system that does not exist in animals or humans.

Arsenal - Arsenal (Imazapyr) has been similarly tested and it is found to have low leaching potential in soils. When available on or in the soil it is broken down rapidly by soil microbes to naturally occurring compounds. When not available, Imazapyr is bound tightly to soil colloids and is unavailable for movement. The half-life in soil is 25 to 65 days.

Extensive chronic and acute toxicity studies have made Arsenal an EPA classified herbicide as practically non-toxic to humans, mammals, birds, fish, aquatic invertebrates and insects. The chronic studies demonstrate that Imazapyr is non-teratrogenic, non-mutagenic, and not a carcinogen.

The mode of action suppresses amino acids of the plant via an enzyme system containing acetohydroxy acid synthase. This enzyme system does not exist in other forms of life including humans and animals.

Revision 5/2/06

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APPENDIX VII – WATERCOURSE CROSSINGS ALONG THE PROPOSED TRANSMISSION LINE ROUTE FOR THE EAST FRANKLIN-TRIUNE 161-KV TRANSMISSION LINE TAP TO CLOVERCROFT 161-KV SUBSTATION IN WILLIAMSON COUNTY, TENNESSEE

Stream ID	Stream Type[1]	Drainage	SMZ[2] Category	Notes
SMZ - 001	Int/WWC	Mill Creek	A (50 feet)	5-foot-wide channel with no flow. 10-foot riparian buffer zone on north bank with pasture beyond. South bank is forested.
SMZ - 002	Int/WWC	Mill Creek	A (50 feet)	5-foot-wide channel with no flow. Stream flows through a cedar forest with grazed pasture to the southeast.
asl03	WWC	Mill Creek	BMPs[3]	1-foot-wide channel that flows through a cedar forest.
asl05	WWC	Mill Creek	BMPs	3-foot-wide channel that flows into SMZ - 002.
asl06	WWC	Mill Creek	BMPs	Same as asl05.
SMZ - 003	Int/WWC	Mill Creek	A (50 feet)	4-foot-wide channel that is deeply incised (5-6 feet). Stream flows through cedar forest with grazed pasture to the southeast.
asb04	WWC	Mill Creek	BMPs	Weakly defined channel with large trees (8-inch diameter) growing in channel. Ends in right-of-way on east side in pasture.
SMZ - 004	Int/WWC	Mill Creek	A (50 feet)	2-foot-wide and 2-foot-deep channel that meanders between two small pastures. Forested riparian zone 25 feet on both sides. Gravel/mud substrate.
asb02	WWC	Mill Creek	BMPs	3-foot-wide and 1-foot-deep channel located 100 feet north of SMZ - 005 and flows into SMZ - 005. South side is forested and north side has 10-foot riparian zone, then pasture.
SMZ - 005	Per	Mill Creek	B (100 feet)	6-foot-wide and 1-foot-deep channel with 20 percent cobble and 80 percent gravel substrate. 50 feet of woods on north side and 5 feet of brush on south side, then pasture. Crosses Access Road 8 upstream of right-of-way. Possible, but not likely habitat for redband darter due to the spring-fed stream with run-pool habitat. Crayfish of genus *Orconectes* present, not identifiable to species.
SMZ - A001	Int	Mill Creek	B (50 feet)	Culverted on Access Road 8. Parallels road for 300 feet. Little or no clearing needed for Access Road 8.
SMZ - 006	Int	Arrington Creek	A (50 feet)	6-foot-wide and 3-foot-deep channel that flows down the center of the right-of-way. Flows into SMZ - 007. Stream flows through pasture starting 500 feet upstream of confluence with SMZ - 007. Above this point stream is forested.
SMZ - 007	Per	Arrington Creek	A (50 feet)	20-foot-wide and 3-foot-deep channel with a wetted width of 3 feet. The north bank has a 25-foot buffer with large trees and pasture beyond. The south bank parallels a dirt road with forest beyond. Substrate is primarily bedrock.
asb07	WWC	Arrington Creek	BMPs	4-foot-wide and 6-foot-deep heavily incised channel with limestone banks that narrows to a weakly defined channel. Primary substrate is limestone slab.
SMZ - 008	Int	Arrington Creek	A (50 feet)	5-foot-wide and 2-foot-deep channel with gravel/cobble substrate. A stack of stones that might be a grave site lies adjacent to flag #3. Stream runs through a broad forested valley.
SMZ - 009	Int	Arrington Creek	A (50 feet)	Two channels that come together on the east side of the right-of-way. Gravel/stone slab substrate with mud interspersed. Stream runs through a mixed forest with heavy brush understory and lots of large woody debris. Crayfish were abundant at the site.
asrb16	WWC	Arrington Creek	BMPs	Same as asrb 14. This feature converges with asrb 15.
asrb15	WWC	Arrington Creek	BMPs	Same as asrb14. This feature drains into SMZ - 010.

APPENDIX VII (CONTINUED)

Stream ID	Stream Type[1]	Drainage	SMZ[2] Category	Notes
asrb14	WWC	Arrington Creek	BMPs[3]	No global positioning signal at time of survey. Features were added to geodatabase files by tracing aerial photos. Deeply incised 8-foot-wide, 5-foot-deep channel that runs down a 35-40° forested slope. Parallel to centerline.
asrb13	WWC	Arrington Creek	BMPs	2-foot-wide, 1-foot-deep channel that runs down a 25-30° forested slope.
SMZ - 010	Int	Arrington Creek	A (50 feet)	3-foot-wide, 1-foot-deep channel that runs down a 10-15° forested slope. Dominant substrate was silt and cobble. Water present only as standing pools at time of survey.
asrb11	WWC	Arrington Creek	BMPs	2-foot-wide, 1-foot-deep channel that runs between SMZ-010 and SMZ-011. Channel ends in an alluvial fan near centerline.
SMZ - 011	Int	Arrington Creek	A (50 feet)	6-foot-wide, 2-foot-deep channel that runs down a 10-15° forested slope. Dominant substrate was boulder and cobble. Water present only as standing pools at time of survey.
asrb09	WWC	Arrington Creek	BMPs	Same as asrb09. Channel converges with asrb09 just west of centerline.
asrb08	WWC	Arrington Creek	BMPs	2-foot-wide, 1-foot-deep channel that runs between SMZ-010 and SMZ-011. Channel ends in an alluvial fan near centerline.
asrb07	WWC	Arrington Creek	BMPs	Same as asrb06.
asrb06	WWC	Arrington Creek	BMPs	2-foot-wide, 1-foot-deep channel that drains into SMZ-012.
SMZ - 012	Int	Arrington Creek	A (50 ft.)	2.5-foot-wide, 1-foot-deep channel that runs through a forested hollow. Primary substrate is sand and gravel with scattered boulders. Salamanders and amphipods were observed.
SMZ - 012	Int	Arrington Creek	A (50 ft.)	Same as SMZ - 012. This stream converges with SMZ-012 15 feet west of centerline.
asrb03	WWC	Arrington Creek	BMPs	Same as asrb01
asrb02	WWC	Arrington Creek	BMPs	Same as asrb01.
asrb01	WWC	Arrington Creek	BMPs	2-foot-wide, 1-foot-deep channel that runs through flat forested area on the east side of a fence line
SMZ - 013	Int	Arrington Creek	A (50 feet)	3-foot-wide and 1-foot-deep channel that flows through a pasture with no woody vegetation present. The substrate of the stream is cobble and gravel with a heavy sediment load.
SMZ - 014	Per	Arrington Creek	A (50 feet)	25-foot-wide and 10-foot-deep channel with a wetted width of 7 feet. Substrate is primarily gravel/cobble with patches of bedrock. Pasture on both sides with a 10-foot riparian buffer of trees and scrub. Fish were present at time of survey.
asb11	WWC	Arrington Creek	BMPs	3-foot-wide and 2-foot-deep channel that flows down a hedgerow across the access road and into a woodlot. The channel dissipates after crossing the access road.
asb12	WWC	Arrington Creek	BMPs	1-foot-wide and 1-foot-deep channel that runs down a hedgerow between pastures.
SMZ - 015	Per	Arrington Creek	A (50 feet)	25-foot-wide and 10-foot-deep meandering channel with some undercutting. Substrate is gravel/cobble with bars forming where the stream bends. 30-foot-wide buffer of large trees with dense understory.
asb14	WWC	Arrington Creek	BMPs	4-foot-wide and 2-foot-deep channel with mud substrate that runs through pasture 200 yards north of the tap point. 10-foot-wide riparian buffer on each side made up of dense scrub with some trees interspersed.

[1] Stream Type: **INT** = Intermittent; **Per** = Perennial; **WWC** = Wet-Weather Conveyance
[2] **SMZ** = Streamside Management Zone
[3] **BMP** = Best Management Practices according to Muncy (1999)